Construction Methods

CHNOLOGY DEPT
DEC 17 1945
ETROIT

DECEMBER 1945

SMALL TOOLS ON CONSTRUCTION

IN THIS ISSUE: A special pictorial section illustrating varied uses of portable power tools and hand tools on construction jobs.

AIR-POWERED IMPACT WRENCH reams ho in structural steel with reamer to which has been welded for holding in chuck

INLAND
STEEL SHEET PILING
Made of special analysis steel providing unusual toughness and high tensile strength. The Inland Interlock permits free driving, yet remains watertight under pressure.
INLAND STEEL CO.
38 South Dearborn Street, Chicago 3
Cincinnati, Detroit, Kansas City, Milwaukee, New York, St. Louis, St. Paul
TRIP · TIN PLATE · BARS · PLATES · FLOOR PLATES
PILING · RAIL · TRACK ACCESSORIES · REINFORCING BARS

TECHNOLOGY DEPT:

CURRENT JOBS

. . . and Who's Doing Them

BUILDINGS

Public—Navy contract for $4,848,000 buildings at White Oak, Md., was awarded to **Chas. H. Tompkins Co.**, of Washington, D. C. Low bid of $2,747,000 was submitted by **H. R. H. Constr. Co.**, of New York, N. Y., for housing project. **Foster & Creighton Co.**, of Nashville, Tenn., will build $2,443,000 hospital at Memphis. Houses in Calgary Alta., will be built by **Shoquist Constr. Co., Ltd.**, of Saskatoon, Sask., for $1,350,000. Army contract for Ordnance plant improvements went to **Fruco Constr. Co.** of St. Louis, Mo., for $1,338,236. Stoker contract for Charlotte, N. C., hospital was awarded to **Detroit Stoker Co.**, of Charlotte, for $1,240,000. Apartments at West Lafayette, Ind., will be constructed by **A. E. Kemmer**, of Lafayette, for $1,118,640. Hospital additions at Legion, Tex., will be built by **Robert E. McKee**, of El Paso, for $1,000,877.

Industrial—Contract for malt house at Greenfield, Wis., was awarded to **Walter W. Oeflein, Inc.**, of Milwaukee, for $5,500,000. **J. B. Pike & Sons**, of Rochester, N. Y., has contract for $3,500,000 plant. **Struck Constr. Co.** of Louisville, Ky., will build $3,000,000 plant. Factory at Avon Lake, Ohio, will be constructed for $3,000,000 by **Collins Constr. Co.**, of Kansas City, Mo. **Stone & Webster Engineering Co.**, of Boston, Mass., has $3,500,000 contract for plant at San Jose, Calif. **Frank Messer & Sons**, of Cincinnati, Ohio, will build $2,016,000 plant at Hamilton. Contract for $1,500,000 plant expansion at Dayton, Ohio, went to **Ferro Concrete Constr. Co.**, of Cincinnati. Plant at Nitro, W. Va., will be built by **J. P. Pettyjohn & Co.**, of Lynchburg, Va., for $1,225,000. **Bechtel-McCone Corp.**, of Los Angeles, Calif., has contract for $2,000,000 plant at Burrell. **Carl M. Geupel Constr. Co.**, of Indianapolis, Ind., has $1,500,000—$2,000,000 contract for plant.

Commercial—Apartments in New York, N. Y., will be built by **Starrett Bros. & Eken**, of New York, for $26,461,764. **W. S. Bellows Constr. Co.**, of Houston, Tex., has $4,000,000 contract for bank. Office building annex at Wilmington, Del., will be built by **Turner Constr. Co.**, of Philadelphia, Pa., for $3,000,000. **Louis C. Dunn Co.**, of San Francisco, Calif., will build $3,000,000 office building at Los Angeles.

HEAVY CONSTRUCTION

Navy contract for pipeline near San Diego, Calif., went to **United Concrete Pipe Corp.**, of Los Angeles, for $3,361,089. **Frank J. Larkin Co.**, of Philadelphia, Pa., submitted low bid of $2,000,000 for radio station. Pier at San Diego, will be built by **Concrete Ship Constructors and Case Construction Co.**, of San Pedro, for $1,943,000. **Merritt-Chapman & Scott Corp.**, of New York, N. Y., has $1,689,290 contract for pier at Baltimore Md.

HIGHWAYS

Among recent highway contract awards are the following: Connecticut: $287,731 to **A. R. Savin Constr. Co.**, of East Hartford. Florida: $289,202 to **Cleary Bros.**, of West Palm Beach. Georgia: $365,449 to **W. L. Florence Constr. Co.**, of Powder Springs. Illinois: $986,015 to **Harrison Engineering & Constr. Corp.**, of Kansas City, Mo. Indiana: $225,034 to **John Dehner, Inc.**, of Fort Worth. Iowa: $528,093 and $438,833 to **Western Contracting Corp.**, of Sioux City. Maryland: $769,662 to **Bethlehem Steel Co.**, of Sparrows Point. New Jersey: $677,468 to **Francis A. Canuso & Son**, of Philadelphia, Pa. New York: $820,737 to **Madison County Constr. Co.**, of Madison.

Copyright, 1945 — Established 1919

McGraw-Hill Publishing Co., Inc., 330 West 42nd St., New York (18)

Construction Methods

A Pictorial Survey of Current Practice, Equipment and Materials

A. E PAXTON, Publisher

ROBERT K. TOMLIN, Editor

Editorial Staff: Vincent B. Smith; Donald D. King; Nelle Fitzgerald; Patricia McGerr; Donald D. Hogate and A. N. Carter (Washington); N. A. Bowers (San Francisco)

DECEMBER, 1945

THE *How* OF IT

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

How **EXTENSION BOOM** delivered concrete to top of 112-ft. tower —p. 71

How **RADIANT HEATING SYSTEMS** profit by tested design and installation tenchiques —p. 74

How **CHEMICAL INJECTIONS** solidified soil to stop foundation settlement —p. 78

How **ODD-SHAPED TANKS** were turned by special trunnion yoke —p. 80

How **SMALL TOOLS** were applied on wide range of construction operations —p. 81

How **RUST-PROOF COATING** was applied to truck for overseas shipment —p. 90

How **SHIPBUILDERS** used small tools for many different tasks —p. 93

How **WELL-TOOLED JOB SHOPS** maintained 4,300 pieces of equipment —p. 94

How **RATCHET DRILL** was supported by special attachment on pipe post —p. 97

How **UP-TO-DATE COST RECORDS** can serve contractors —p. 97

How **INGENIOUS PIER REPLACEMENT** saved failing bridge —p. 98

How **SAFETY DEVICE** held lock ring in place during inflation of scraper tire —p. 102

How **WALL OF STEEL SHEETPILES** protected concrete footings against settlement —p.103

How **ON-THE-JOB TRAINING** speeded completion of atomic bomb project by 45,000 workers —p. 104

How **MODIFIED SUCTION DREDGE** operated at record depth of 100 ft. —p. 108

How **WIDE TRACKS** for tractors were developed by U. S. Engineer Board —p. 112

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK (18), N. Y

JAMES H. McGRAW, Founder and Honorary Chairman

Editorial and Publishing Offices: 330 West 42nd St., New York (18); 520 North Michigan Ave., Chicago (1); 68 Post St., San Francisco (4); 738-9 Oliver Bldg., Pittsburgh; Aldwych House, London, W. C. 2, England. Branch Offices: Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Los Angeles; Atlanta, Ga.

JAMES H. McGRAW, JR., President
WILLARD T. CHEVALIER, Vice-President (for Editorial Operations)
CURTIS W. McGRAW, Senior Vice-President and Treasurer
JOSEPH A. GERARDI, Secretary
HOWARD EHRLICH, Vice-President (for Business Operations)
J. E. BLACKBURN, JR., Director of Circulation

CONSTRUCTION METHODS, December, 1945. Volume 27, Number 12. Published Monthly, price 20¢ a copy. **Return Postage Guaranteed.** Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42nd Street, New York (18), N. Y. **Subscription rates**—United States, Mexico and Central and South American countries, $1.00 a year, $1.50 for two years, $2.00 for three years. Canada, $1.50 a year, $2.50 for two years, $3.00 for three years. Great Britain and British Possessions, 12 shillings a year, 36 shillings for three years. All other countries, $2.00 a year, $6.00 for three years. Please indicate position and company connection on all subscription orders. Entered (or reentered) as second class matter December 16, 1936, at the Post Office of New York, N. Y., U. S. A., under the act of March 3rd, 1879. Printed in U. S. A. Cable address: "McGrawhill, New York." Member of A. B. P. Member of A. B. C.

Contents copyrighted 1945 by McGraw-Hill Publishing Co., Inc., 330 West 42nd Street, New York (18), N. Y.—All rights reserved.

CHANGE OF ADDRESS

Director of Circulation,
Construction Methods,
330 West 42nd Street,
New York 18, N. Y.

Please change the address of my Construction Methods subscription.

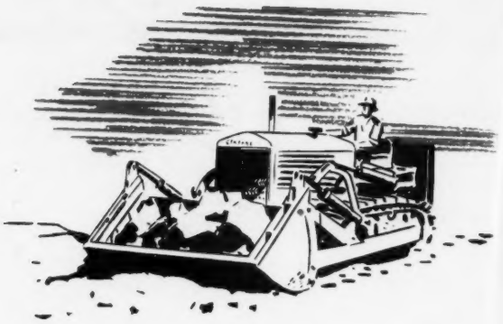
Name .....

Old Address .....

New Address .....

New Company Connection .....

New Title or Position .....



Added attraction!

To provide greater resistance to shocks, strains and twists of crawler tractor operation, the track frames of Oliver "Cletrac" tractors are reinforced with sections of heavy plate steel . . . an "added attraction" that adds years of dependable service.

Strategically located to provide greatest strength, these steel sections are securely riveted in place by modern hydraulic riveters. This *extra* protection is typical of the many added features that are standard on Oliver "Cletrac" tractors. Through the use of the most modern equipment and production methods, quality is built in . . . high cost is engineered out.

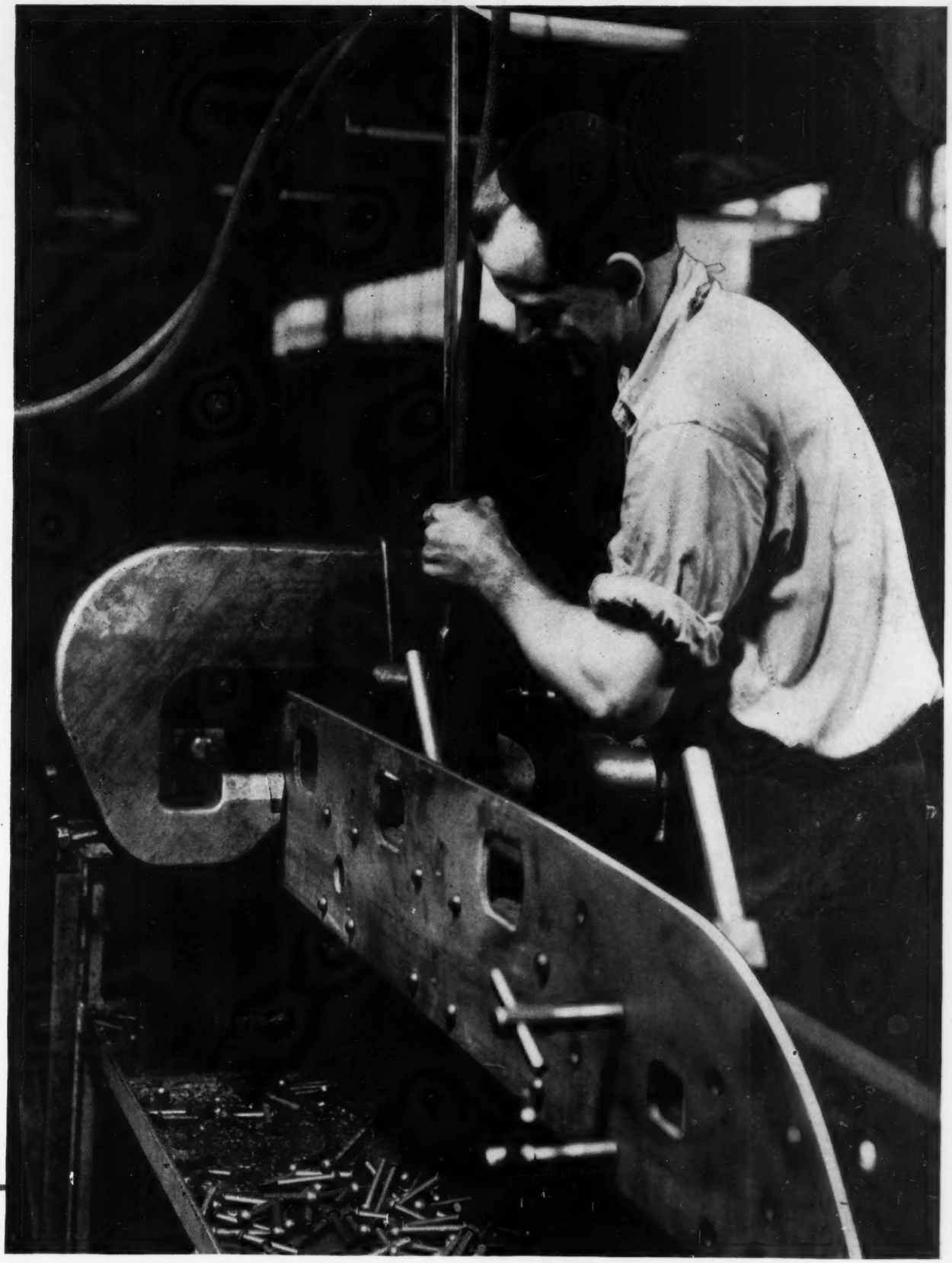
Maintenance of this standard enables your Oliver "Cletrac" dealer to offer you the finest in crawler tractors . . . for your every need.

CLETRAC

THE OLIVER CORPORATION Cletrac

a product of

The OLIVER Corporation



Cold riveting track frames with a Hydraulic Yoke Riveter in the Oliver "Cletrac" plant.

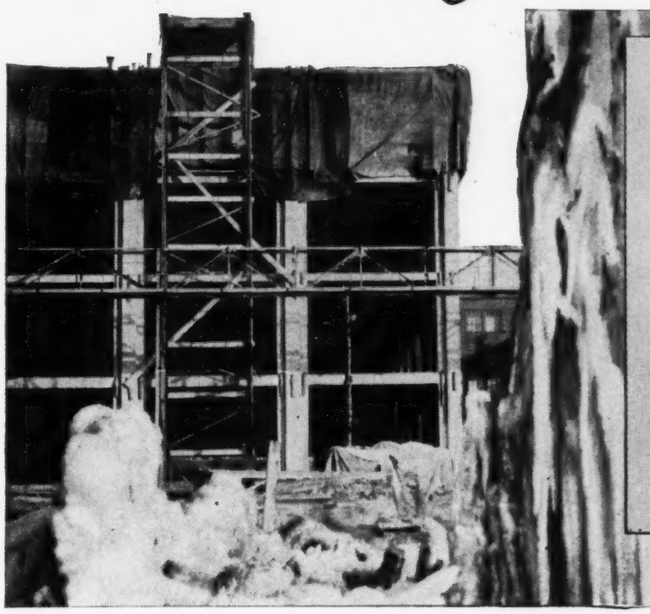
THE JOB JESTER

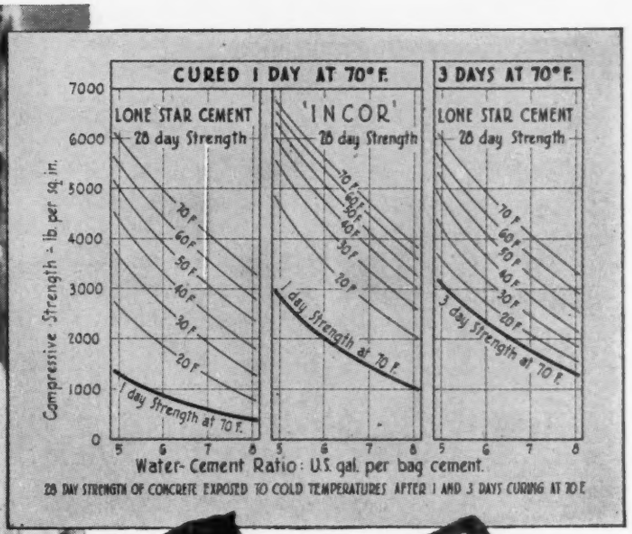
CARTOONS DRAWN FOR CONSTRUCTION METHODS

"She was watching me work and asked if I minded if she shook off a few pounds."

"Yes, I know you were in the Seabees, but in civilian life we don't drill holes with a .45."

'INCOR' IS COLD-WEATHER #1 safety factor





HEAT-CURED only ONE DAY AT 70°, 'Incor' concrete is service-strong, safe from freezing . . . and at 28 days produces strengths 25% to 30% greater than even Lone Star Cement cured 3 days. Use 'Incor'—

SAVE 2 DAYS HEAT-CURING ON EACH POUR

HALVE FORM AND TARP COSTS

REDUCE FREEZING RISK

KEEP JOB SPEED UP... JOB COSTS DOWN

Use 'Incor'* where it saves you time and money —elsewhere, use Lone Star Cement. That's selective concreting—the soundest way to get utmost value per dollar invested.

Write us at 342 Madison Ave., New York 17, for "Winter Concreting Book."

*Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

Offices: ALBANY • BIRMINGHAM • BOSTON • CHICAGO • DALLAS • HOUSTON • INDIANAPOLIS • JACKSON, MISS. KANSAS CITY, MO. • NEW ORLEANS • NEW YORK • NORFOLK • PHILADELPHIA • ST. LOUIS • WASHINGTON, D. C.

LONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 15 MODERN MILLS, 25-MILLION BARRELS ANNUAL CAPACITY

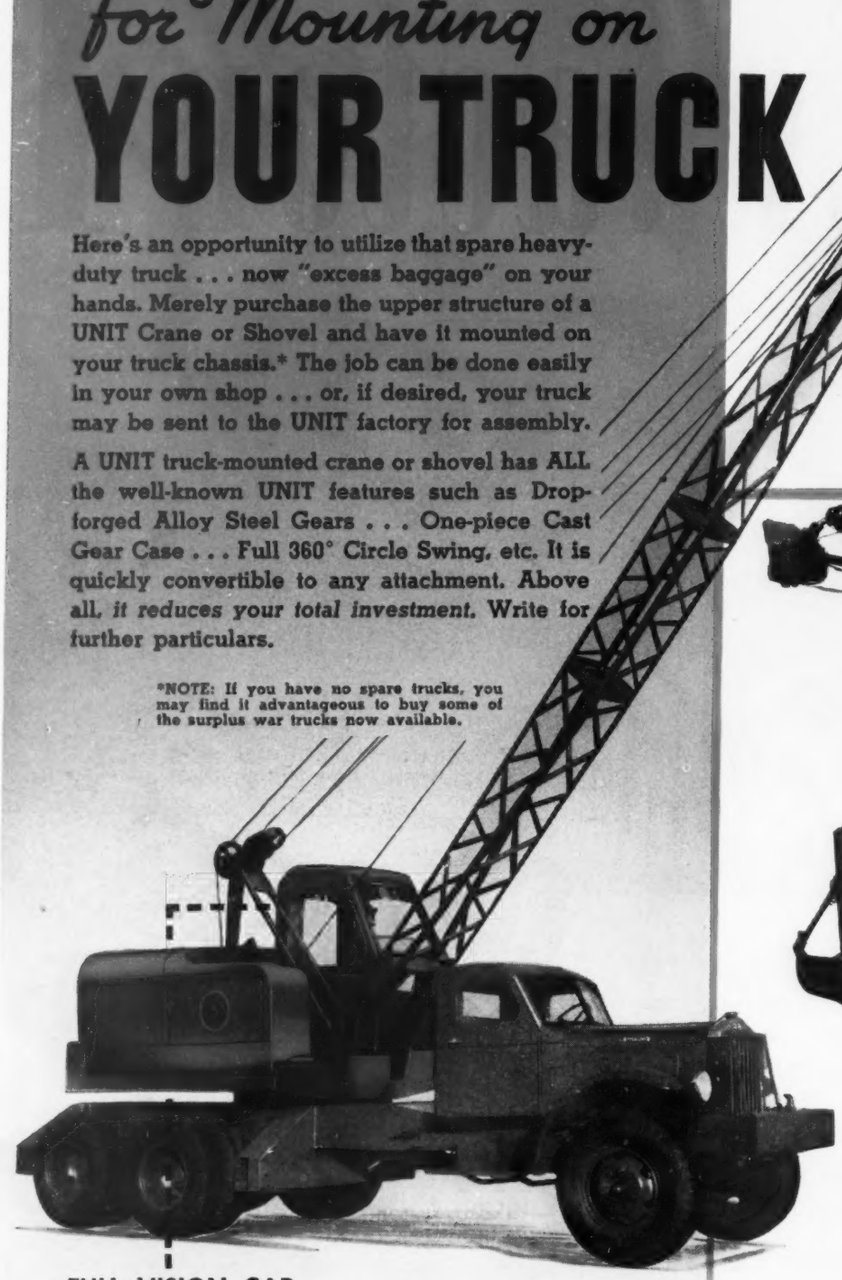
UNIT 5 or 10 ton Crane

for Mounting on YOUR TRUCK

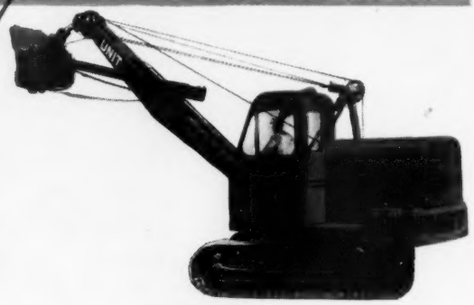
Here's an opportunity to utilize that spare heavy-duty truck . . . now "excess baggage" on your hands. Merely purchase the upper structure of a UNIT Crane or Shovel and have it mounted on your truck chassis.* The job can be done easily in your own shop . . . or, if desired, your truck may be sent to the UNIT factory for assembly.

A UNIT truck-mounted crane or shovel has ALL the well-known UNIT features such as Drop-forged Alloy Steel Gears . . . One-piece Cast Gear Case . . . Full 360° Circle Swing, etc. It is quickly convertible to any attachment. Above all, *it reduces your total investment.* Write for further particulars.

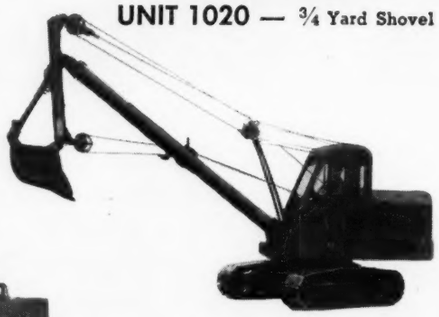
*NOTE: If you have no spare trucks, you may find it advantageous to buy some of the surplus war trucks now available.



CONTACT FACTORY DIRECT FOR PRICE AND DELIVERY



UNIT 1020 — ¾ Yard Shovel



UNIT 514 — ½ Yard Trenchoe

FULL VISION CAB . . .
Affords complete 360° visibility for operator at all times. Promotes safety. Increases operating efficiency. Speeds up the job.

½ and ¾ Yd. Excavators
5 to 10 Ton Cranes Convertible to ALL Attachments.

UNIT CRANE & SHOVEL CORP. MILWAUKEE 14, WISCONSIN, U.S.A.

4863-1P-C

EUCLIDS Proved Their Mettle on This California Project

● The construction of Santa Fe Dam — a tremendous earth fill flood control project on the San Gabriel River near Azusa, California — required the hauling of 14,000,000 cu. yds. of material. Four large western contractors* combined their forces and equipment on this job.

Approximately 6,000,000 cu. yds. were hauled in 22 Euclids on hauls varying from 1500 ft. to 4.5 miles. They moved about 1,500,000 yards of core material over the longest haul, and the balance — consisting of sand, gravel and boulders — was hauled an average of 4,000 feet.

During peak operations a million yards were moved in a single month. Euclid speed, capacity and dependability of performance helped to make this record possible.

Euclids are built for tough, off-the-highway service — to move earth economically. See your distributor for facts and figures on what Euclids will do for you — or write us direct.

*Morrison-Knudsen Co., Winston Bros. Co., J. F. Shea Co. and Ford J. Twaits Co.

Outstanding Euclid Features

Exclusive Euclid all-enclosed double-reduction full-floating planetary type drive axle . . . unequaled for years of trouble-free performance on the toughest jobs.

Euclid wedge-shaped hopper which distributes more of the payload weight to drive wheels for better traction . . . rigidly welded, riveted and bolted construction.

Internal expanding air brakes, 17¼"x5½" brake shoes . . . individual steering brakes on drive wheels for better steering and traction control. Sturdy three-way universal hitch permits maximum maneuverability. Euclid wheel wind . . . simple air controlled mechanical device for closing doors, tested by years of trouble-free service. Doors opened instantly by control valve on steering column . . . closed in a few seconds on the return trip.

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

EUCLID SELF-POWERED HAULING EQUIPMENT For EARTH ROCK COAL ORE

WHY THE COST PER TON IS LOWER WITH A B-G CENTRAL ASPHALT PLANT

The high daily output of this Barber-Greene Central Plant brings down the cost per ton of bituminous mix.

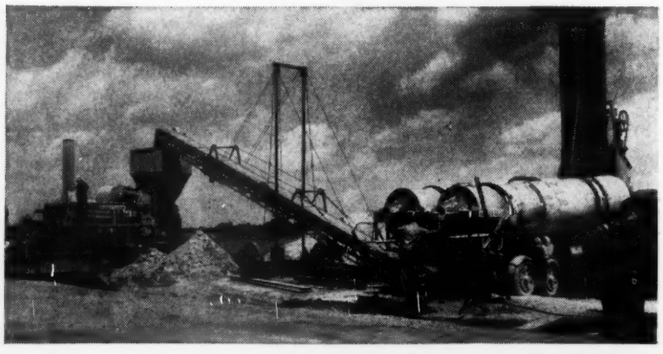
Continuous, straight-in-line, automatic measuring and mixing keeps production at the peak, hour after hour.

You'll find that the capacity of a B-G Central Plant is higher—size for size, weight for weight, investment for investment—than any other outfit you can buy. What's more, you can hook up any combination of these individual, carefully engineered, portable B-G units that best meets your construction conditions and specifications.

Complete portability means further savings—in transportation time and expense. You can locate at the most economical point . . . reduce truck mileage . . . increase your margin of profit on the smaller jobs. Several sizes available according to your requirements. Barber-Greene Company, Aurora, Illinois.

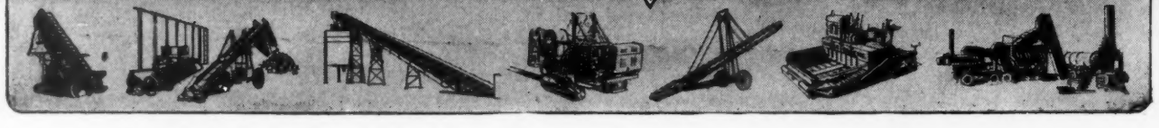
Above: A complete B-G Central Plant for production of highest type mixes, with Reciprocating Feeder, Cold Elevator, Dual Drum Dryer, Dual Cyclone Dust Collector, Hot Elevator, Gradation Control Unit, and Mixer.

Right: Here's one of the combinations for turning out "intermediate" type mixes. Gradation Control Unit is omitted. This set-up bridges the gap between high-type mixes and the "low cost" type of road mix construction.



45-19

Barber-Greene B G *Constant Flow Equipment*



Greater bruise resistance built into this new kind of tire

RECORDS show that a new B. F. Goodrich construction principle greatly benefits users of off-the-road tires. For example, a war emergency earth-moving contract required 42 trucks. Trucks had an 11-mile loaded haul down a slight grade at 30 m.p.h. Load — 16 yards, averaging 3000 lbs. per yard. Gross axle loads were: empty—front, 9000 lbs.; drive, 12,000; rear, 10,000; full—front, 11,000; drive, 36,000; rear, 38,000.

On this urgent job, tires had to be subjected to unusual, continuous overload — a practice not recommended. But, the contractor-engineer's report on comparative service of the three brands of 21.00/24 off-the-road tires used, during a 20-day working period, reveals the following: Of 70 brand "A" tires, 24 were removed due to failures; of 46 brand "B", 7 failed; of 38 B. F. Goodrich, *none* failed.

One reason why B. F. Goodrich off-the-road tires stand up so well is that their built-in *shock shield* protects them against the pile driver blows of hitting rocks, ruts, and other unavoidable damaging obstructions. This shield is a special tire construction principle that greatly reduces shocks and impacts that cause bruises and blow-outs. It's a B. F. Goodrich development—exclusive with B. F. Goodrich off-the-road tires.

Users of these off-the-road tires report fewer bruises, far less ply separation, longer wear. You can gain the same savings. Your own comparison tests of B. F. Goodrich tires alongside other makes will prove it to you.

Supplies of some sizes are available for immediate delivery; stocks of certain other sizes are still limited. See the B. F. Goodrich dealer, or write us direct. *The B. F. Goodrich Company, Akron, Ohio.*

Truck Tires BY

B.F. Goodrich

BAR MATS that speed the job

As the big pavers and the squat finishing machines move along, the work goes smoothly and quickly if you're using Bethlehem Bar Mats. For they're rigid, easy to handle, and lie flat once they're in place.

In the stockpile and alongside the road, they'll stand a lot of rough treatment. No time wasted straightening out your bar mats—because these Bethlehem mats, made of new-billet steel bars clipped together, really *can* take it!

Bethlehem can supply not only bar mats but all the other steel products used in concrete highways and highway bridges. Buy the Bethlehem way, and you get coordinated service that will save you confusion, delay and extra paper work. Your order is handled as a unit, with shipments scheduled to reach the job as needed.

Write or phone the nearest Bethlehem district office today for full information about Bethlehem road steel service.

BETHLEHEM HINGED BAR MATS

For convenient handling and stockpiling in wide widths, Bethlehem has developed a new hinged reinforcing-bar mat which folds over double. Made like the regular bar mat, of deformed bars clipped together, it is easier to truck, and can be handled by two men. It is less likely to be damaged in handling, is readily installed, and lies flat.

BETHLEHEM PRODUCTS FOR HIGHWAYS

Road Joints • Center Strip • Dowels • Dowel Bar Supports • Reinforcing Bars Bar Mats • Bar Ties • Reinforcing for Concrete Pipe • Bridge Floor Reinforcing Concrete Slab Spacers • Welded Wire Fabric • Guard Rails • Guard Posts and Brackets • Wire Rope and Strand • Right-of-Way Fence and Posts • Anchor Rods • Pipe • Hollow Drill Steel • Digging Bars • Structural Steel • Mold Boards • Corrugated Sheets • Turnbuckles • Tie Rods, Spikes, Bolts and Nuts Timber Bridge Hardware • Sheet and H-Bearing Piling

★ BETHLEHEM STEEL ★

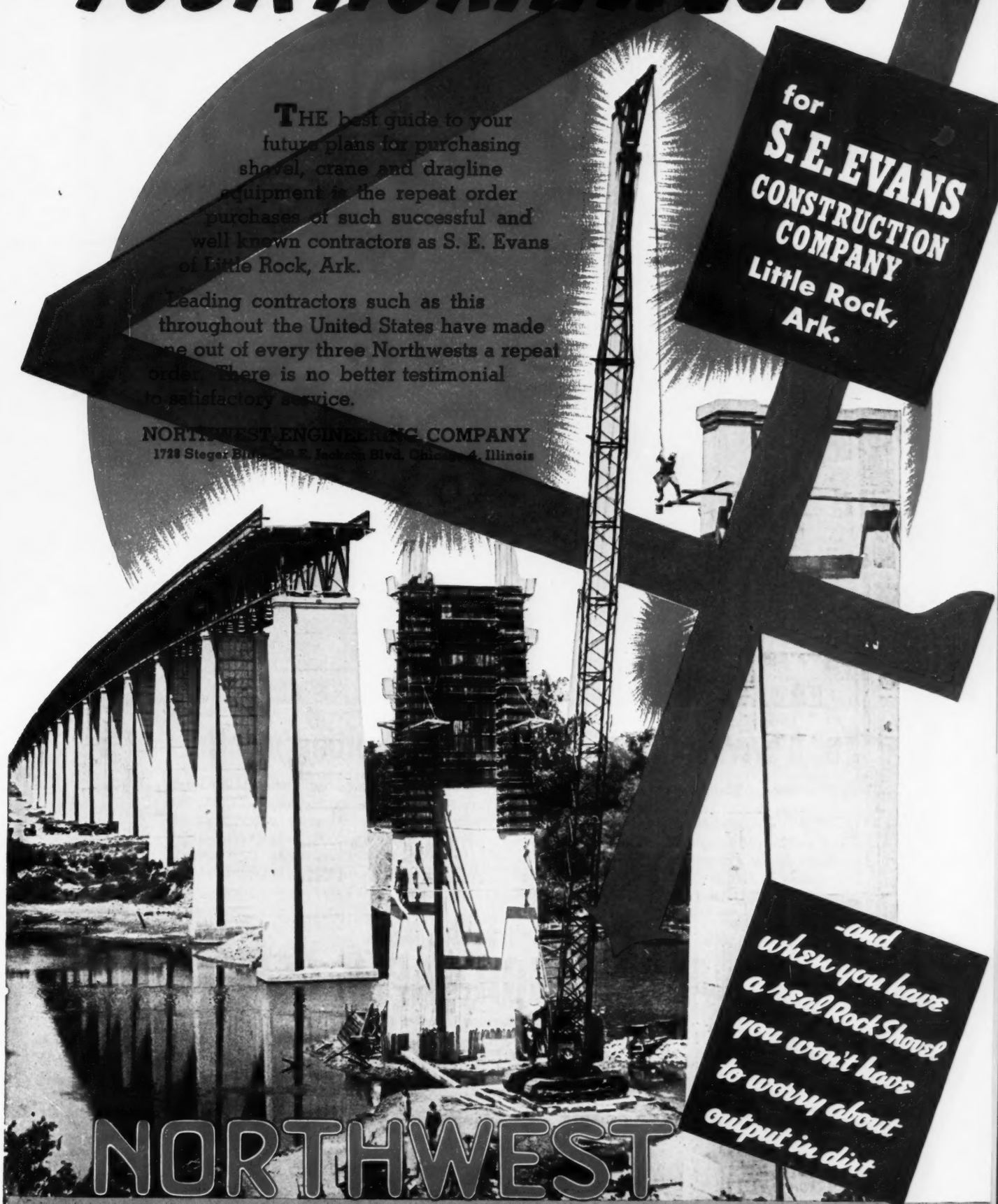
FOUR NORTHWESTS

THE best guide to your future plans for purchasing shovel, crane and dragline equipment is the repeat order purchases of such successful and well known contractors as S. E. Evans of Little Rock, Ark.

Leading contractors such as this throughout the United States have made one out of every three Northwests a repeat order. There is no better testimonial to satisfactory service.

NORTHWEST ENGINEERING COMPANY
1728 Steger Bldg., 28 E. Jackson Blvd. Chicago 4, Illinois

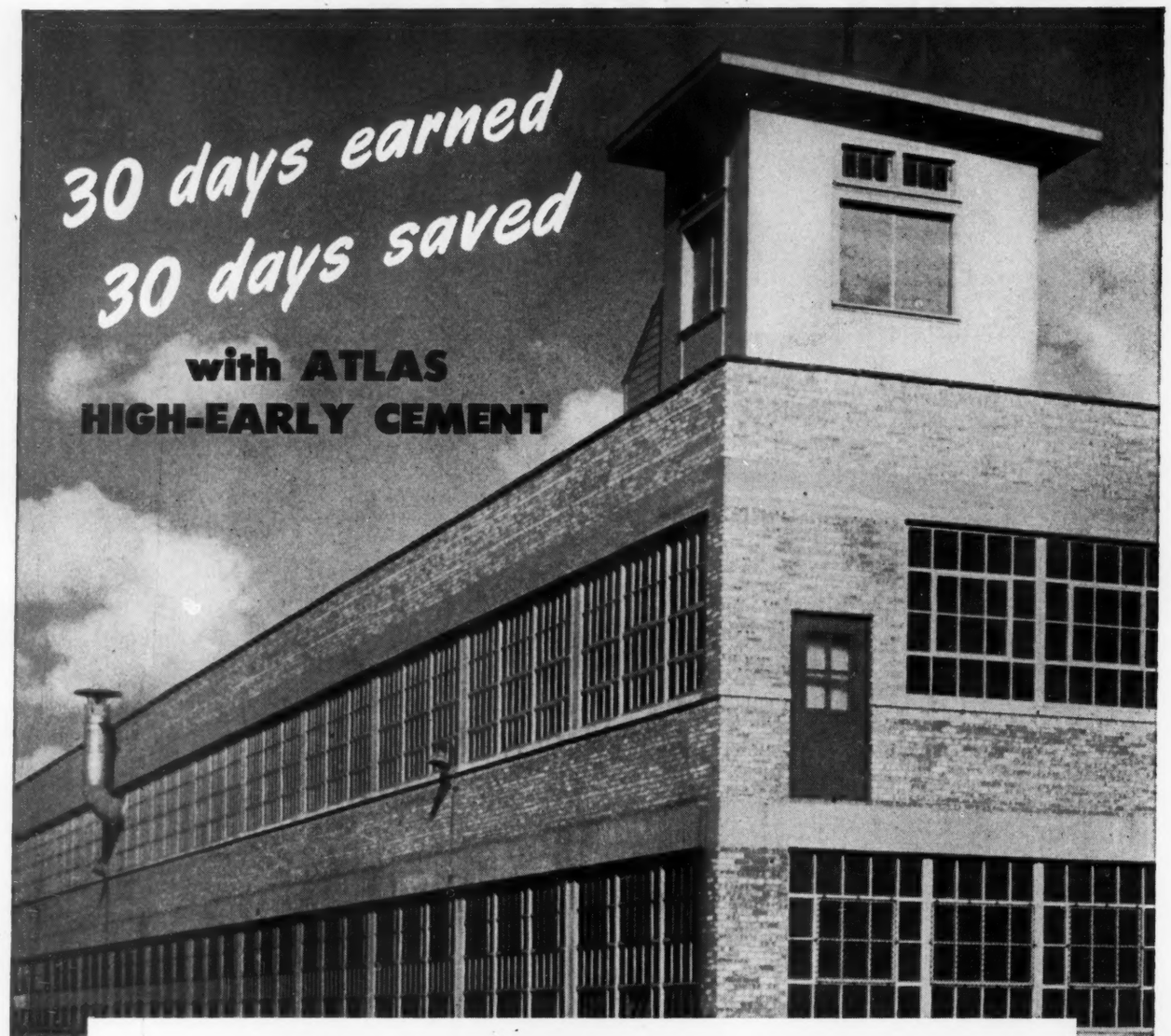
for
S. E. EVANS
CONSTRUCTION
COMPANY
Little Rock,
Ark.



-and
when you have
a real Rock Shovel
you won't have
to worry about
output in dirt

NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS



A working month instead of a waiting month

The Galvin Manufacturing Corporation of Chicago needed an addition to its plant. The plans called for a three-story structure of reinforced concrete frame. With Atlas High-Early cement, the job was accomplished in freezing weather and completed in 90 days. Had regular portland cement been used, it would have required 120 days.

In winter especially, Atlas High-Early saves fuel, tarpaulins and salamanders; permits earlier use of concrete; conserves manpower, lumber, time; reduces overhead.

For further details, write to Universal Atlas Cement Company, Chrysler Building, New York 17, N. Y.

Save Time with

ATLAS HIGH-EARLY CEMENT

Product of Universal Atlas Cement Company

(UNITED STATES STEEL CORPORATION SUBSIDIARY)

OFFICES: New York • Chicago • Albany • Boston • Philadelphia • Pittsburgh • Cleveland Minneapolis • Duluth • St. Louis • Kansas City • Des Moines • Birmingham • Waco

CM-H-74

ADDITION TO THE GALVIN MANUFACTURING CORPORATION PLANT, CHICAGO. Victor L. Charn, Architect; Ragnar Benson, Inc., General Contractor, Chicago.

Concrete by Pipe Line . . . gets it from here to there in
ONE OPERATION
CONCRETE BY PIPE LINE
GETS THERE FASTER . . .
MORE ECONOMICALLY . . . WITH
A MINIMUM OF PREPARATORY
WORK . . . ON THE MAJORITY OF
CONCRETE PLACING JOBS
A Frank Statement about Pipe Line Concrete
A NEWER AND BETTER METHOD BACKED BY 12 YEARS
OF DEVELOPMENT AND CONSTANT IMPROVEMENT
DID YOU KNOW . . .
YOU CAN
TRANSPORT,
ELEVATE
AND PLACE
CONCRETE IN
ONE OPERATION

This new booklet tells you how!

Write for your copy today. Find out for yourself how you can transport, elevate and place concrete in *one* operation . . . faster, more efficiently, at less cost . . . by *pumping* through pipe line.

You'll find page upon page of important questions and answers . . . pages of actual applications and results . . . mechanical data and general construction information . . . all accurately and carefully compiled to give you the most complete information possible on PUMPCRETE . . . the pump that *pumps concrete.* It's the newer and better method for *all* types of construction jobs.

This new booklet is ready for you now. Your copy will be mailed immediately. There is no cost or obligation. Address Chain Belt Company, Construction Division, 1664 West Bruce Street, Milwaukee 4, Wisconsin.

REX

CHAIN BELT COMPANY of *Milwaukee*

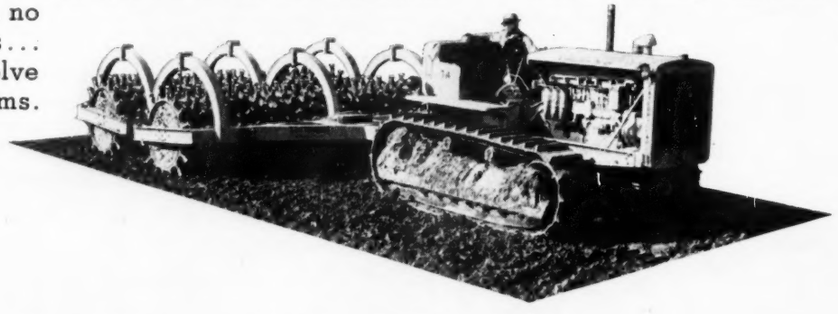
CONSTRUCTION MACHINERY

PUMPS PAVERS PUMPCRETES MOTO-MIXERS MIXERS

Southwest *Compaction Units*

Southwest's leadership in the development of new Construction Machinery designs has greatly influenced modern methods of compaction . . .This giant unit, specially designed and manufactured by Southwest is seen at work on the construction of Clover Field, where it broke records for compaction efficiency. The 100-ton load is equally distributed over the huge tires which track in staggered formation. . . Southwest's wide experience in designing special Sheepsfoot Tamping Rollers and Compaction Units can be put to work for you too. Whatever the job specifications . . . no matter what the conditions . . . Southwest can help you solve your compaction problems. Write for latest bulletins.

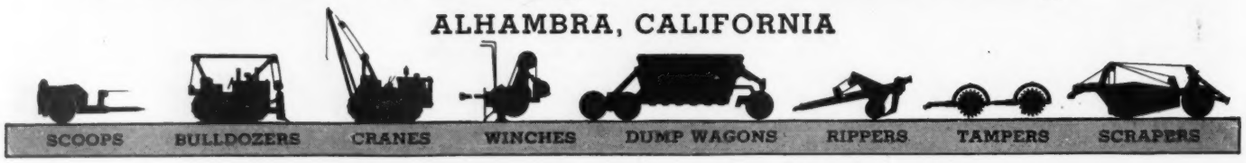
This special, 6-drum Southwest Sheepsfoot Tamper is shown on the construction of Prado Dam in Southern California.



CONSTRUCTION MACHINERY DIVISION

Southwest Welding & Manufacturing Co.

ALHAMBRA, CALIFORNIA



SPECIFY SCHRAMM AIR COMPRESSORS . . . AS THIS CONSTRUCTION JOB DID!

Another Compressed Air job in which Schramm Air Compressors were used!

For the many, many needs of compressed air in construction work Schramm more nearly fits the requirements of the industry because of these features: 100 per cent water cooled . . . compact and lightweight . . . mechanical intake valve...and forced feed lubrication.

Illustrated here is work being done on a Philadelphia street . . . one of many applications. Schramms are built in sizes ranging from 20 to 420 cu. ft. actual air, in every type of mounting and assembly. They are designed for heavy duty, continuous service. Because they are so rugged, so well designed, they stand the toughest treatment and steadily furnish the amount of air desired. Start planning for the New Era in Construction by using a Schramm. Write today for an up-to-the-minute booklet just published.

SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

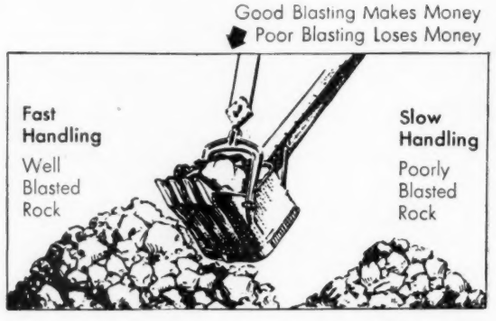
"All Is Not Gain That Is Put in the Purse"

...beware of false savings in blasting, too!

Many an operator has tried to save pennies when buying explosives, only to lose dollars as a result of poor breakage, low shovel output, and excessive wear and tear on equipment.

Good blasting insures good results *on the whole cycle of operations.* It means full buckets, full crusher production, efficient use of man-power hours.

This does not necessarily mean more explosives. It is the right handling of the whole blasting procedure that counts. Atlas has 120 different kinds of explosives—each individually tailored to do a special kind of job. Your Atlas Representative will help you select and use them *effectively.* The up-to-date know-how he represents will save you time and money.

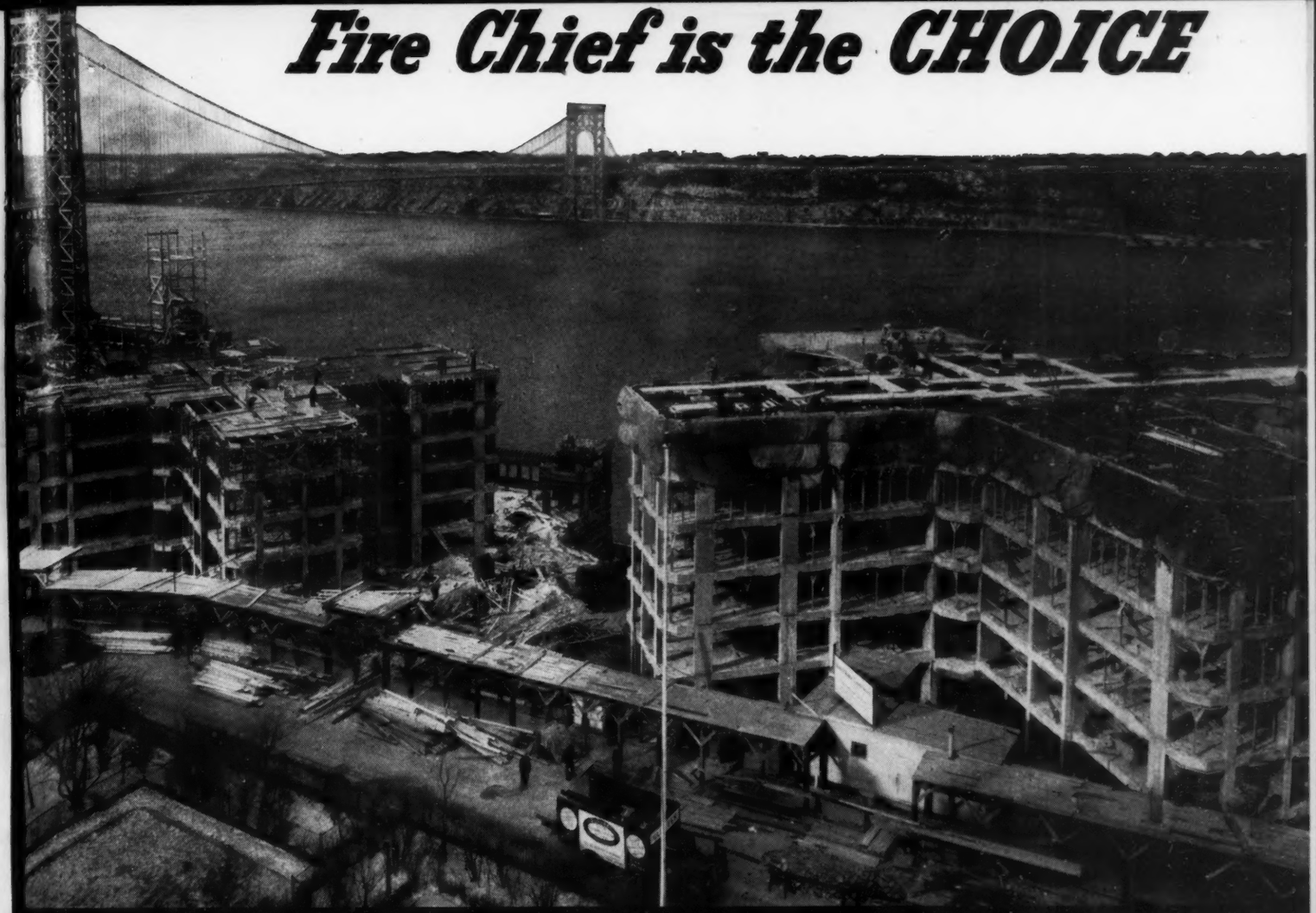


ATLAS EXPLOSIVES
"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

Fire Chief is the CHOICE



for Under Cover *Construction*

Many a costly construction fire resulting from flammable windbreaks and tarpaulins could have been prevented if the canvas had been Fire Chief Finished Hooperwood Duck.

That is why—today—Fire Chief is the choice of leading construction companies. It will not flame or support combustion, even in contact with a welding torch.

Then too, this Hooperwood "Engineered Canvas" is equally resistant to water, weather and mildew—greatly lengthening its service life.

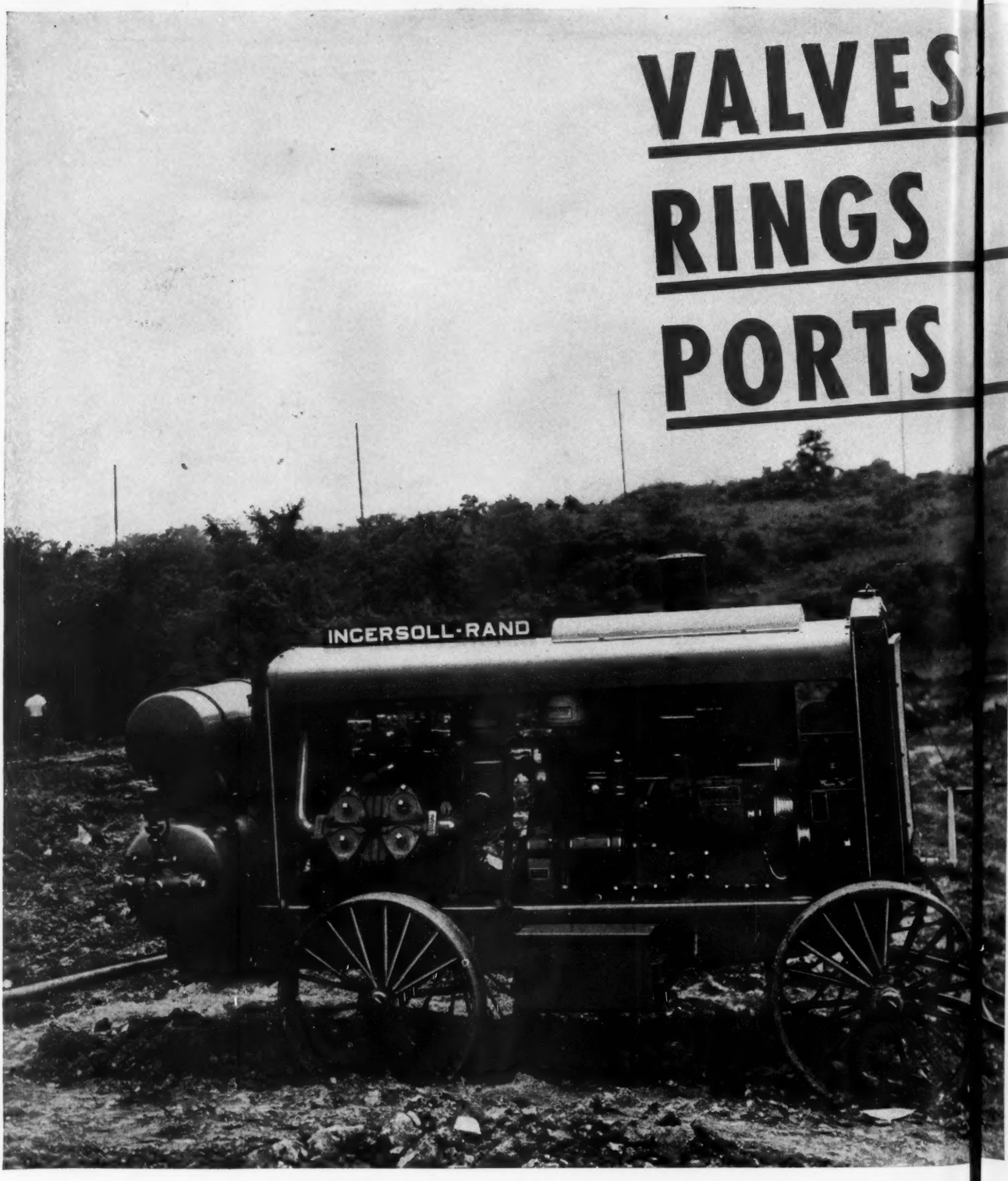
Approved by the Underwriters Laboratories and the Associated Factory Mutual Fire Insurance Companies, Fire Chief also meets all Government requirements for fire, water, weather, wear and mildew-resistant canvas.

Specify Fire Chief for protection—and profit from its economy.

WM. E. HOOPER & SONS CO.
New York **PHILADELPHIA** Chicago
Mills: WOODBERRY, BALTIMORE, MD.

• *Fire-Chief Finished* (PATENTED) •

HOOPERWOOD COTTON DUCK



TUNE IN THE
TEXACO STAR THEATRE
WITH JAMES MELTON
SUNDAY NIGHTS—
METROPOLITAN OPERA
BROADCASTS
SATURDAY AFTERNOONS

TEXACO
REG. T. M.

TEXACO

CLEAN
FREE
OPEN

...with compressor oils that don't form hard carbon deposits

GET these important benefits . . . assure fewer repairs and replacements, longer and more trouble-free service between overhauls, better performance at lower cost . . . by lubricating your air compressor with *Texaco Alcaid, Algol or Ursa Oils.*

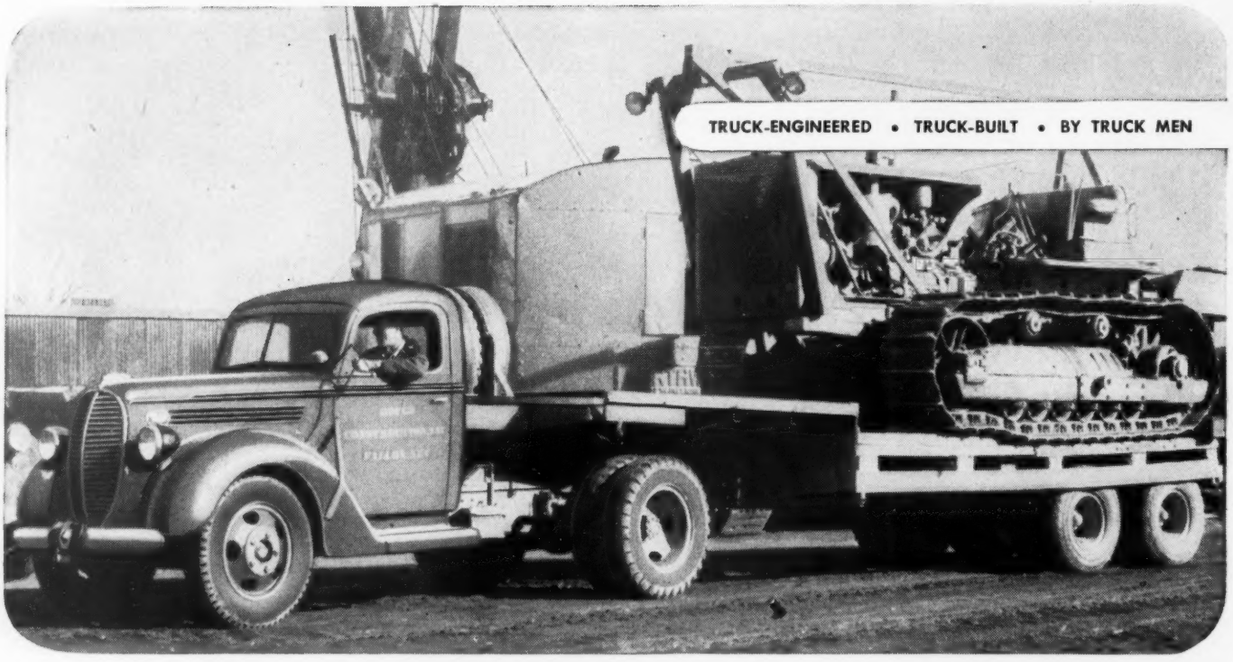
Texaco Alcaid, Algol and Ursa Oils are products born of many years of intensive research by The Texas Company in the field of air compressor lubrication. They are made from carefully selected crudes. The lubricating fractions are processed by modern Texaco methods in one of the world's largest refineries under the constant supervision of trained Texaco technicians. This is your assurance of uniformly high quality no matter where you buy them.

Texaco Products and Lubrication Engineering Service are available through more than 2300 Texaco distributing plants in the 48 States. Contact the nearest one, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

Better Trucks for YOUR Business!



"We Marvel at the Endurance Built into Ford Trucks"

Certainly few operators are in a better position to judge over-all truck quality than Dodge Construction, Inc., . . . which makes this cordial letter from Mr. E. J. Maupin, Jr., president, mighty convincing evidence that Ford Trucks really pay out on the job. Mr. Maupin wrote:

"Our business is constructing highways, airports, etc. Our 18 four-yard Ford Dump Trucks, carrying six-ton loads, have had tough going. Competitive trucks on the same jobs just 'can't take it' like the Fords. The latter keep right on running. We marvel at the 'staying on' qualities built into these trucks. And almost every town has a Ford Dealer who seems to feel it is his duty to exert every energy to provide the best of service. We want more and more Fords."

See the new Ford Trucks—especially the new Ford Heavy Duty dump truck chassis. Consider their rugged construction—frame, springs, axles, transmissions, clutches, universals . . . their 100 HP V-8 or 90 HP six-cylinder engines, with important engineering advancements. What you see will convince you that Ford Trucks can make profits in your business, too.

Ford

ADVANCED ENGINEERING IN NEW FORD TRUCKS

More Economy and Endurance
Easier Servicing

A STILL GREATER 100 HP V-8 ENGINE with NEW Ford steel-cored Silvaloy rod bearings, more enduring than ever in severe service • NEW aluminum alloy cam-ground 4-ring pistons for oil economy • BIGGER, more efficient oil pump and IMPROVED rear bearing oil seal • NEW longer-lived valve springs • NEW improvements in cooling • NEW efficiency in ignition • in carburetion • in lubrication • in ease and economy of servicing operations • And available in all truck chassis except C.O.E. units—the rugged, thrifty 90 HP FORD SIX-CYLINDER ENGINE, with many important advancements.

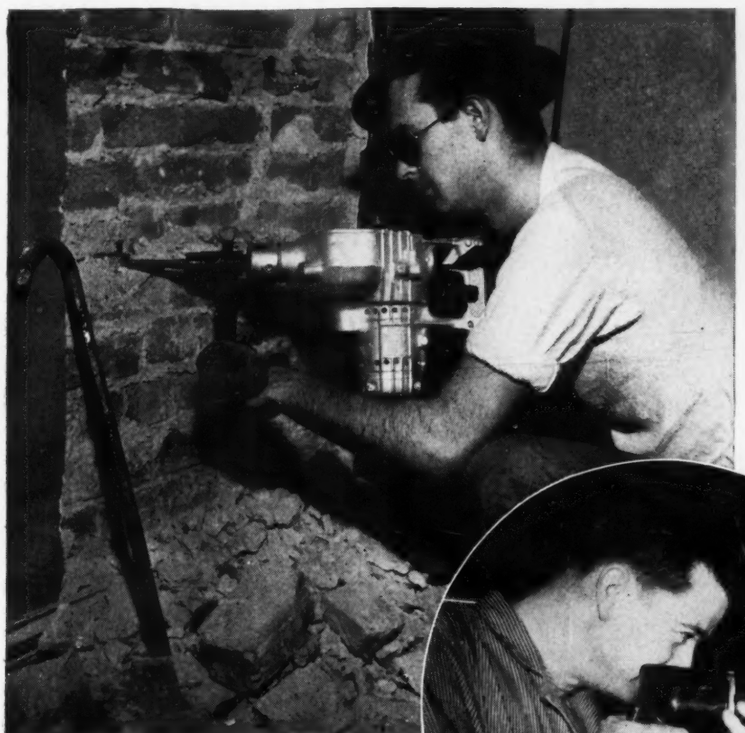
FORD CHASSIS ADVANTAGES: Easy accessibility for low-cost maintenance • Universal service facilities • Tough, forged front axles • Extra-sturdy rear axles with pinion straddle-mounted on 3 large roller bearings, ¾-floating type in light duty units, full-floating in all others • 3 axle ratios available (2 in 1-ton unit) • 2-speed axle available in heavy duty units at extra cost • Powerful hydraulic brakes, large drums, cast braking surfaces • Rugged 4-speed transmission with NEW internal reverse lock optional at extra cost on light duty units, standard on all others.

FORD TRUCKS

MORE FORD TRUCKS ON THE ROAD • ON MORE JOBS • FOR MORE GOOD REASONS

SMALL TOOLS DO BIG JOBS

on Construction and Maintenance



Power-packed, yet light and easy to handle, Thor Portable Electric Tools save hours and dollars on construction, repair and renovation work. Check the many tasks they'll do for you *faster*. See or call your nearby Thor dealer or Thor branch office today.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Boulevard, Chicago 6, Illinois

BIRMINGHAM BOSTON BUFFALO CLEVELAND DETROIT LOS ANGELES
MILWAUKEE NEW YORK PHILADELPHIA PITTSBURGH SALT LAKE CITY
ST. LOUIS SAN FRANCISCO TORONTO, CANADA LONDON, ENGLAND

MAKE HOLES FASTER with Thor electric drills. Capacities from ¼" to 1 ¼". Speeds for any material.

DEMOLITION IS QUICK and sure with the Thor-Nado portable electric hammer.

SAWING IS SIMPLE . . . and safe with a Thor Electric Saw. 5 models with capacities from 6 to 12-in. blades.

Thor PORTABLE ELECTRIC TOOLS FOR EVERY CONSTRUCTION JOB

- *Drills*
- *Saws*
- *Hammers*
- *Grinders*
- *Sanders*
- *Polishers*
- *Screw Drivers*
- *Nut Setters*
- *Tappers*
- *Nibblers*

Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

THERE'S *Extra* OUTPUT IN *Easy* OPERATION

The toughest kinds of civilian and military digging have proved the output value of the full, smooth control you get with ⅜-, ½-, and ¾-yard Bucyrus-Eries. Accurate feel, smooth quick response, and properly proportioned power make it easy for the operator to combine crowd, hoist, and swing for big output. He is in direct control during every part of the digging cycle, permitting him to set an even, high-speed digging pace. The conveniently located, easily moved levers and the comfortable cab reduce his fatigue, let him maintain the fast pace for long periods.

9E45

Besides full, smooth control there are numerous other reasons why Bucyrus-Eries are leading yardage-producers. The full Bucyrus-Erie performance story will convince you.

SO. MILWAUKEE **BUCYRUS ERIE** WISCONSIN

SOON

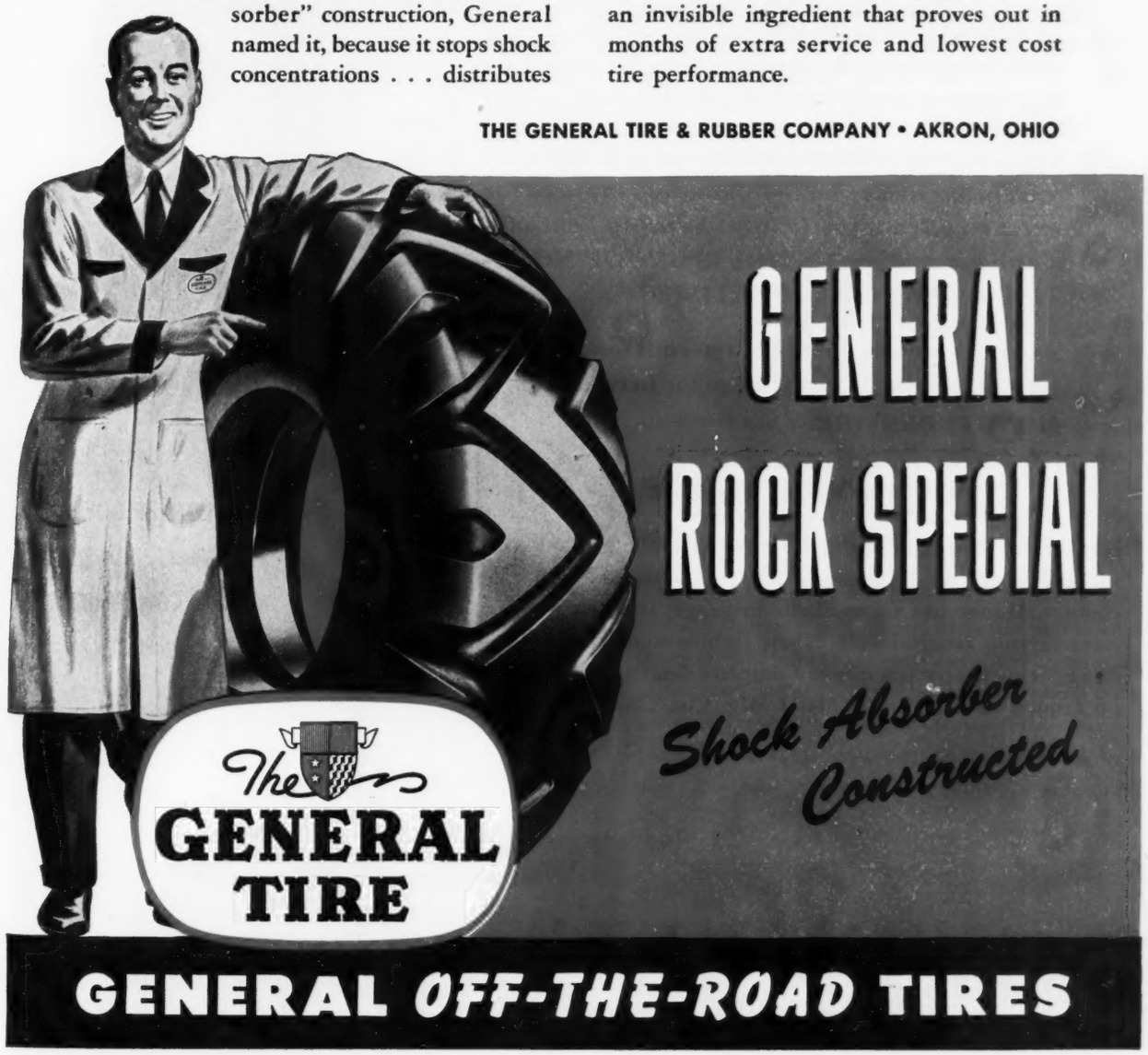
The toughest Rock Special of all Times!

● The General Rock Special is soon to be 100% virgin rubber again . . . and built to the toughest, heavy duty standards known.

Building synthetic rubber tires to do the same jobs as natural rubber tires during the war, developed and *proved* a new method of tire engineering at General. "Shock Absorber" construction, General named it, because it stops shock concentrations . . . distributes the loads and stresses uniformly . . . preserves the tire carcass under the hardest service conditions.

But General's coming Rock Special is more than just an engineered all-rubber tire. It will give you . . . as always . . . General's special kind of Top-Quality . . . an invisible ingredient that proves out in months of extra service and lowest cost tire performance.

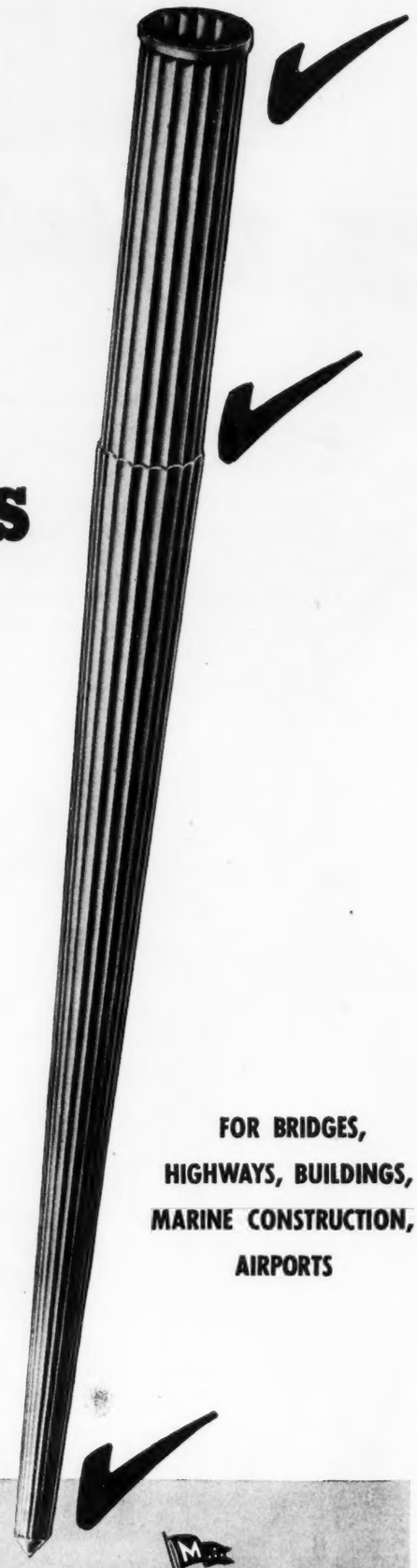
THE GENERAL TIRE & RUBBER COMPANY • AKRON, OHIO



✓Check

these 3 points before you specify

FOUNDATION PILES



1 ***Can they be quickly, easily, economically driven with average job equipment? TAPERED, FLUTED MONOTUBES CAN.***

2 ***Can you extend them quickly, easily in the field, even in low head room—eliminating the need for extensive tests for length, keeping "cut-off" waste to a minimum? THIS IS ONE OF MONOTUBES' PRINCIPAL FEATURES.***

3 ***Are they hollow, tubular to permit quick, easy, sure inspection, top to toe, prior to concreting? MONOTUBES ARE.***

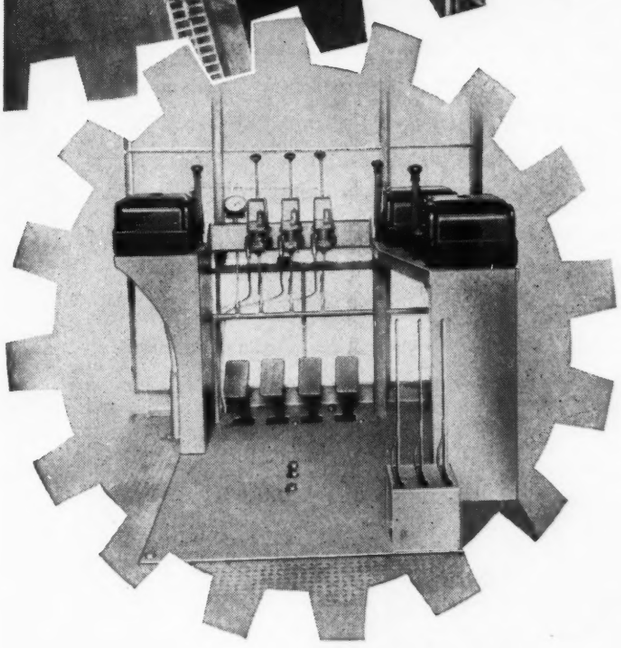
Extra Plus Values

Fluted steel Monotubes have the enthusiastic endorsement of skilled, experienced engineers and contractors all over the country. Monotubes are available in gauge, size and taper to meet varying requirements. Their light weight speeds handling, helps keep costs down. Complete details, catalog, free on request to The Union Metal Mfg. Co., Canton 5, Ohio.

FOR BRIDGES, HIGHWAYS, BUILDINGS, MARINE CONSTRUCTION, AIRPORTS

UNION METAL

Monotube Tapered Piles



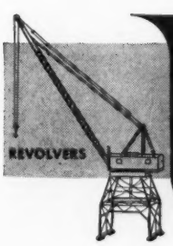
"AMERICAN" PATENTED CONTROLS

Guarantee Greater

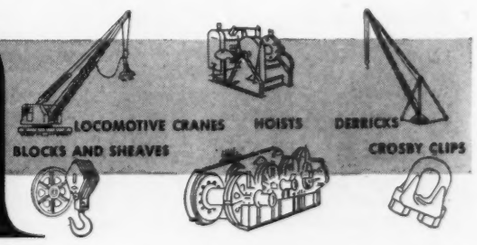
OPERATING EFFICIENCY!

The air-operated, synchronized controls of "American" equipment add much to its greater productive capacity. And it's these major units of materials handling machinery that "set the pace" on a job! Result: the productive capacity of the whole operation—including auxiliary equipment AND ALL LABOR CREWS—is definitely increased!

"American" controls make it possible to swing loads through shorter arcs—without hesitation and in minimum time. Hoisting, boom raising and slewing are all blended into one movement. Also, operating cycles are rapid, regular and steady because the "finger tip" controls do not tire operators. Our engineers can probably show you "American" equipment in use nearby.



AMERICAN
HOIST & DERRICK CO.
St. Paul 1, Minnesota
CHICAGO · SAN FRANCISCO · NEW YORK

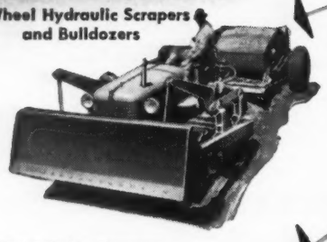


GAR WOOD ROAD MACHINERY

WITH ALLIS-CHALMERS DIESEL POWER

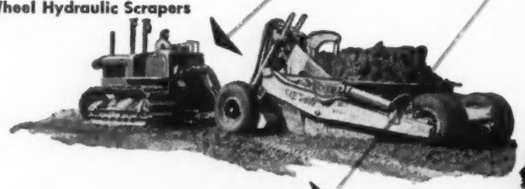
Puts you in the Driver's Seat

2-Wheel Hydraulic Scrapers and Bulldozers



4-Wheel Cable Scrapers

4-Wheel Hydraulic Scrapers

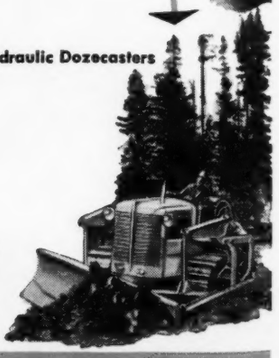


Heavy Duty Rippers

You're in full control of the yardage, the costs and timing of your earth moving jobs when you use Gar Wood Road Machinery. This equipment has proved its consistently high efficiency and complete reliability on thousands and thousands of jobs. It is the No. 1 choice of large numbers of users as shown by the present volume of orders—the greatest by far in Gar Wood history. It puts you in the driver's seat because it's built for the driver—to move the most earth with the least effort. Place your orders with your Allis-Chalmers dealer.

Cable Dozecasters

Hydraulic Dozecasters



Gar Wood Road Machinery is Sold Through ALLIS-CHALMERS Dealers Everywhere

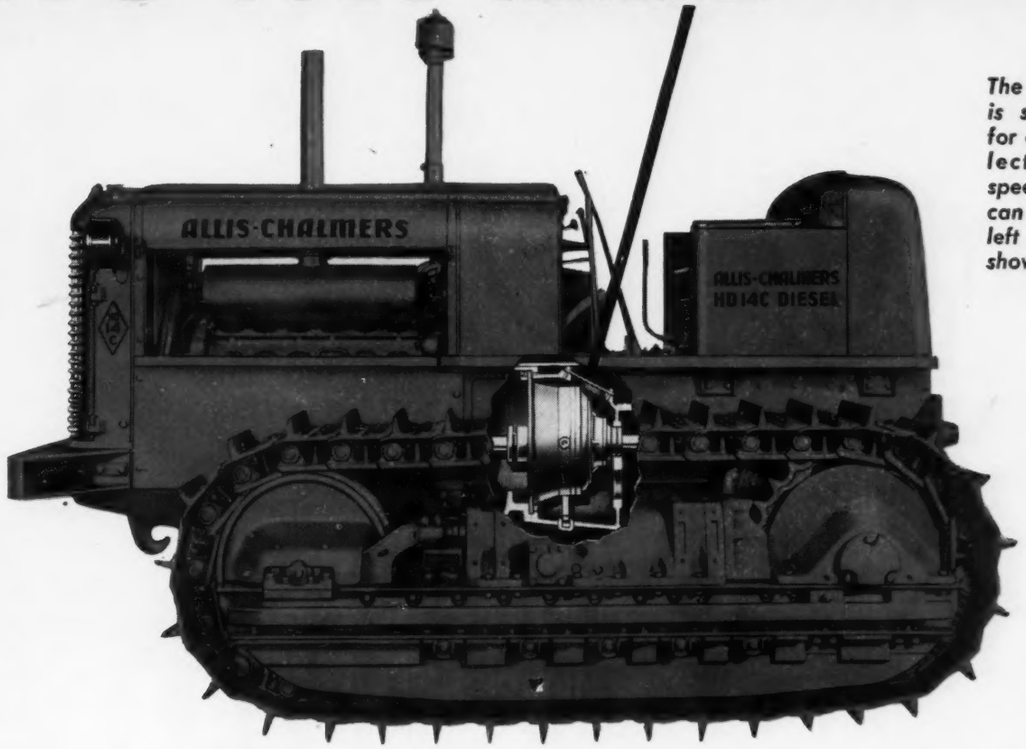
ROAD MACHINERY DIVISION

GAR WOOD INDUSTRIES, Inc.

DETROIT 11, MICHIGAN

OTHER PRODUCTS OF GAR WOOD INDUSTRIES INCLUDE HOISTS AND BODIES • WINCHES AND CRANES • TANKS • HEATING EQUIPMENT • MOTOR BOATS

NOW.. A TORQUE CONVERTER TRACTOR



The torque converter is simply a device for automatically selecting maximum speed at which load can be moved. At left is cutaway view showing location in tractor.

ALLIS-CHALMERS MEETS THE NEED

Here it is . . . the tractor of the times . . . torque converter driven . . . tried, tested, proved over the last five years on every type of construction work . . . now in full production! It's revolutionary — different from any tractor you've ever seen . . . amazing, the way it smooths out and steps up tractor performance.

25% MORE WORK **is accomplished because horsepower output of engine is held near maximum — the torque converter balances tractor speed with load to give maximum operating speed at all times. This means many more yards moved, more miles of roads built.**

LESS GEAR SHIFTING, **less operator fatigue, because the torque converter instantly, automatically does, in effect, what the operator of a conventional tractor accomplishes when he shifts gears — makes available the necessary pull or push to handle the load. The engine cannot be overloaded or stalled — keeps running even when an extreme overload pulls tractor to a standstill.**

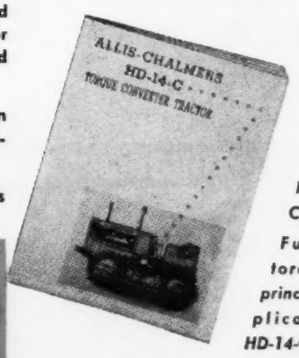
SMOOTHER OPERATION — **longer tractor life and longer life of auxiliary equipment is assured by smoother operation. There is gradual acceleration and even application of power — of particular advantage in lengthening the life of cable.**

CUSHIONED PROTECTION — **cushion of oil eliminates solid contact between engine and power train, protecting all parts of tractor and auxiliary equipment against shock and abuse.**

MORE ACCURATE CONTROL — **operator can inch into any desired position smoothly, gradually, safely.**

SIMPLIFIED DRIVE — **the torque converter is a simple mechanism, only two moving parts separated by a cushion of oil. In addition, transmission is simplified — three forward speed ranges cover every need, with operation in any gear from zero to maximum — up to 2.89, 3.61, 7.13 m.p.h. . . . to 3.36 m.p.h. reverse.**

You will want to investigate these and the many other advantages of this revolutionary, money-making Diesel tractor. Get all the facts from your Allis-Chalmers dealer.



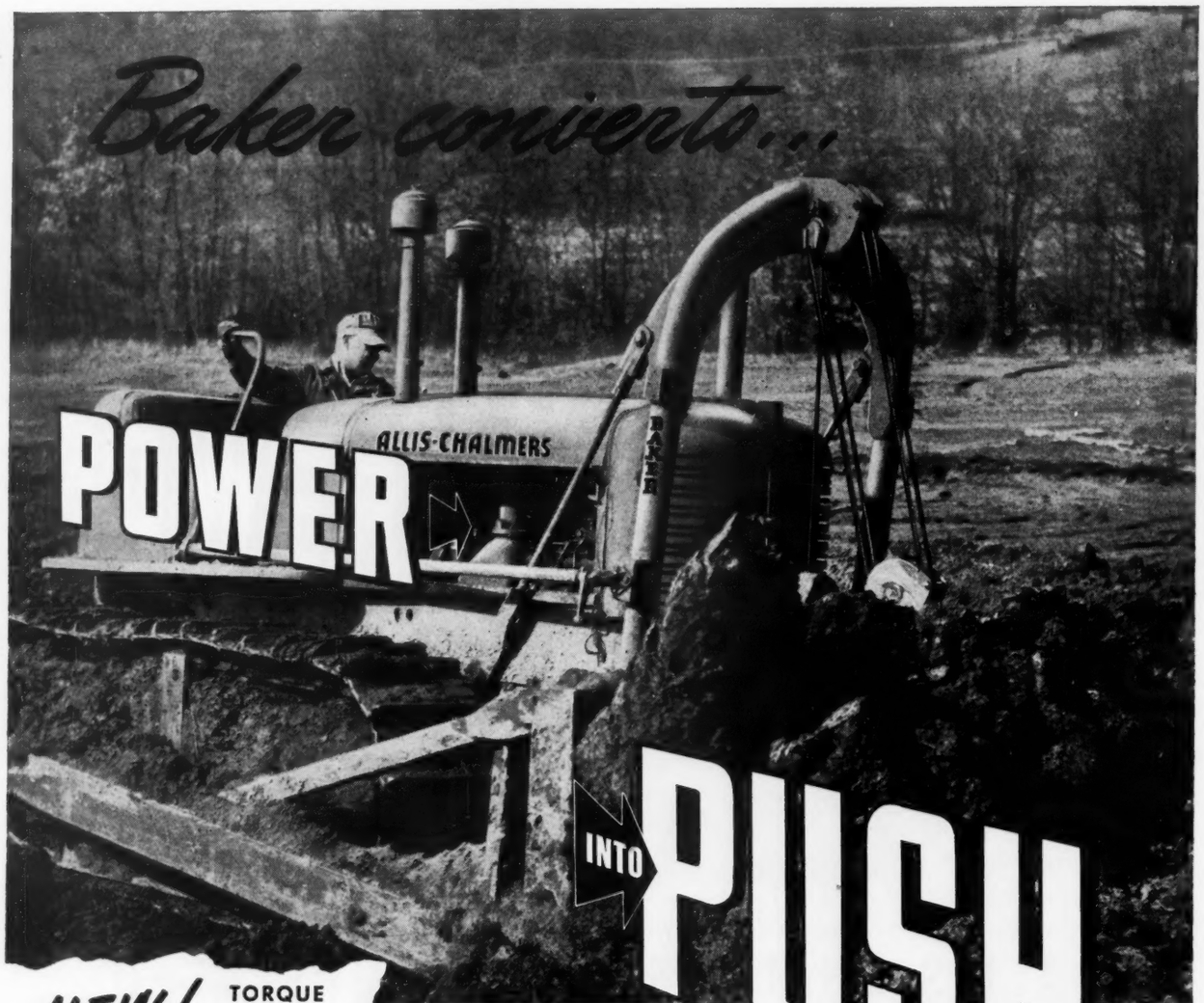
FREE

Write for this book:

"Allis-Chalmers HD-14-C Torque Converter Tractor"

Fully explains torque converter principle and its application to the HD-14-C.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



NEW! **TORQUE CONVERTER BULLDOZER**

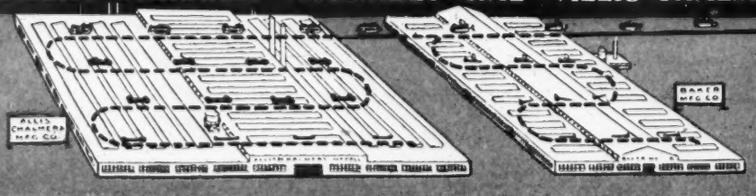
More traction, more power, more speed — more yardage. Get the facts on this great new development — the HD 14-C equipped with a Baker 'dozer.

Baker bulldozer design applies the FULL power of the tractor to the load. Correctly mounted, perfectly balanced, soundly designed, and cooperatively engineered with Allis-Chalmers, Baker cable and hydraulic 'dozers assure maximum yardage from every tractor.

Baker design keeps the tracks on the ground, uses the full weight and power of the tractor to develop push on the blade. You get deeper penetration, smoother operation and more yardage per shift, when a Baker digs in. That's why there are more Baker 'dozers mounted on A-C tractors than all others combined.

BAKER MFG. CO. SPRINGFIELD, ILL.

"STRAIGHT THROUGH" ASSEMBLY LINE – ALLIS-CHALMERS TO BAKER TO YOU!



The modern Baker plant with its completely equipped fabricating, machining and blacksmithing shops adjoins the Allis-Chalmers crawler tractor plant. When you order an A-C tractor with Baker bulldozer or gradebuilder, your tractor leaves the A-C assembly line, crosses a narrow court and goes on the Baker final assembly line.

LOOK TO OSGOOD...

FOR

PROFITABLE PERFORMANCE

AND

ECONOMY OF OPERATION

OSGOOD 1½ yard shovel on Pan-American Highway near Tapachula, Mexico.

A COMPLETE LINE OF

POWER SHOVELS

CRANES

BACKHOES

DRAGLINES

PILE DRIVERS

Crawler and Pneumatic-Tire Mounted

Diesel, Gas, Electric

⅜ cu. yd. to 2½ cu. yds.

Construction, excavating and material handling jobs can be handled economically and profitably IF the equipment you use has been designed for dependable, low-cost performance. Before selecting your equipment, check into design, materials and construction—these are the factors that count!

These are the factors featured by OSGOOD during "100 years of service" . . . a century in which OSGOOD pioneered numerous advancements in design and construction that have become standard for the industry. *Look to OSGOOD* for such cost-cutting features as: better cab visibility, fewer wearing parts, greater accessibility of machinery, larger diameter power-operated frictions, greater "payloads" due to less counterweight and a host of other features that pay off in profits.

Write Today for Information

THE GENERAL EXCAVATOR COMPANY
CRANES, DRAGLINES AND SHOVELS
DIESEL, GAS, ELECTRIC

Associated with The General Excavator Company

OSGOOD

CRANES-SHOVELS MARION OHIO U.S.A. OSGOOD CENTRAL

THE OSGOOD COMPANY • MARION, OHIO

ARMY E NAVY

OSGOOD
SHOVELS, DRAGLINES
CRANES

✓ HELPS SET

You'll be surprised how many ways—
in how many departments Socony-Vacuum's
Complete Lubrication Service for Contractors
saves time and work—helps you win
your constant race against deadlines!

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
Magnolia Petroleum Co., General Petroleum Corp. of Calif.

NEW RECORDS

Fewer machine breakdowns—more continuous plant operation . . . you get these advantages and many more when you use Socony-Vacuum's *Complete* Lubrication Service! From quality products to expert "trouble-shooting," every detail of this service is designed to speed operations.

The completeness of our line guarantees you exactly the right oil or grease for *every* application . . . eliminates the need for special orders.

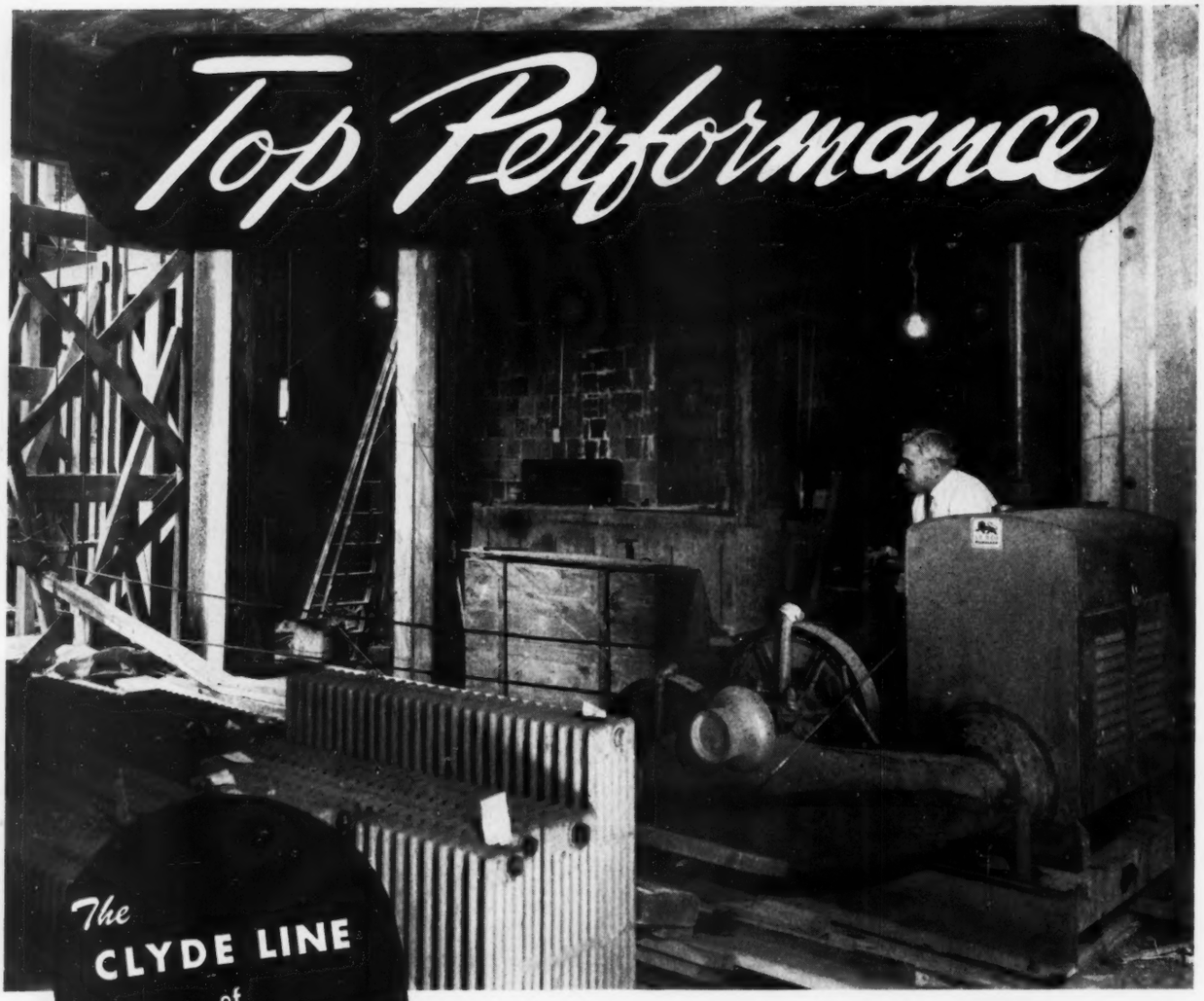
In addition, your Socony-Vacuum Representative arranges regular on-the-job deliveries . . . fits tested maintenance schedules to your own requirements . . . offers practical help with "problem" equipment . . . calls in engineering aid, when needed! He'll also show your men the newest time-saving lubricating techniques.

When you can get really *Complete* Lubrication Service, why be satisfied with just "gas and oil"! Call in Socony-Vacuum today.

"ON YOUR STAFF—BUT NOT ON YOUR PAYROLL"—
Your Socony-Vacuum Representative

CORRECT LUBRICATION FOR EVERY PART OF EVERY MACHINE YOU OPERATE . . .
PLUS
1 ENGINEERING HELP on time-losing operating problems; 2 TESTED MAINTENANCE SCHEDULES that minimize service man-hours—keep equipment on the job; 3 PROMPT, DEPENDABLE DELIVERY—a reliable, on-the-job service that eliminates inventory problems for you!

TUNE IN "INFORMATION PLEASE"—MONDAY EVENINGS, 9:30 E.S.T.—NBC



The CLYDE LINE of QUALITY EQUIPMENT

HOISTS
DERRICKS
WHIRLEYS
CAR PULLERS
HAND POWERS
BUILDERS TOWERS
MINE HOISTS
WINDLASSES
WINCHES
PILE DRIVERS
BARGE & DREDGE MACHINERY

Clyde Gasoline Hoists mean top performance . . . a reputation established by thousands of job tested machines. Top performance to you means better building schedules and less operating costs.

Clyde hoists are scientifically engineered and carefully constructed to give you more dollar-for-dollar value. Excessive weight has been eliminated with no sacrifice of strength . . . their practical design provides economy, efficiency and ease of operation.

Profit with a Clyde on your next job. Write for special bulletins giving complete specifications and construction details on any type of equipment. Clyde sales and service agencies are in all principal cities.

CLYDE

CLYDE IRON WORKS, Inc.

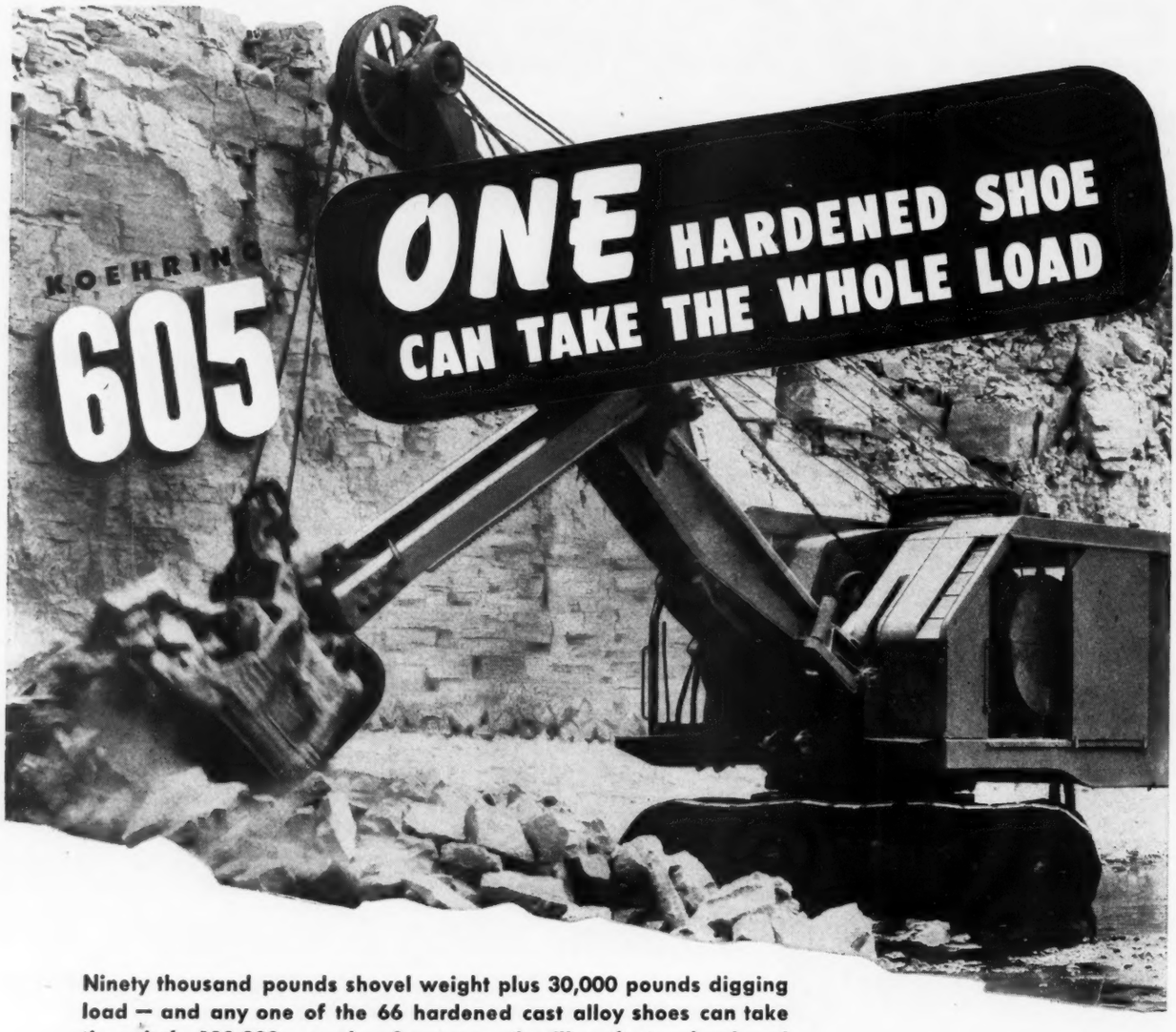
Duluth 1, Minnesota

Speed Vital Equipment back on the Job

. . . WITH FASTER TOOLS FOR EVERY SERVICE OPERATION

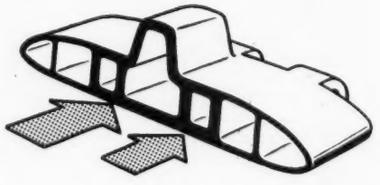
With equipment taking a punishing beating, *minutes count* on every job of maintenance and repair. Fast, efficient Snap-on tools *for every service operation* help keep vital equipment on the job . . . help speed construction by making short work of repairs and adjustments. From smallest service tools to extra-heavy duty and jumbo wrench sets the Snap-on line answers every hand tool need. Snap-on's direct-to-user tool service is available through 38 factory branch warehouses. A Snap-on representative will gladly call *on the job.* Write for 1945 Snap-on catalog and address of nearest branch.

SNAP-ON TOOLS CORPORATION, 8084-L 28th Ave., Kenosha, Wisconsin



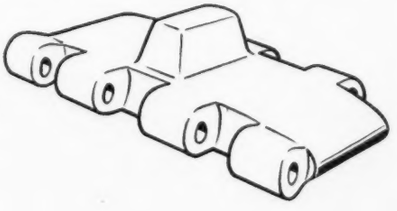
Ninety thousand pounds shovel weight plus 30,000 pounds digging load — and any one of the 66 hardened cast alloy shoes can take the whole 120,000 pounds. So strong, they'll outlast unhardened high carbon steel shoes at least three to one.

Double Thick WHERE THEY TAKE THE LOAD



Cross section shows double thick crawler roller paths, rigidly supported by double thick inside ribs. Cast, seamless, this shoe takes loads as a unit. Heat-treated alloy has basic strength, ductility to ride out shock loads, hardness to resist abrasion.

Self-Cleaning, OF COURSE! NO DIRT TRAPS



Like the shoes on Koehring equipment for 25 years, the hardened cast alloy shoes on the Koehring 605 have no dirt traps. Smoothly streamlined, they shed mud and stones and won't shower grit on the crawler belt rollers.

KOEHRING COMPANY • *Milwaukee 10, Wisconsin*

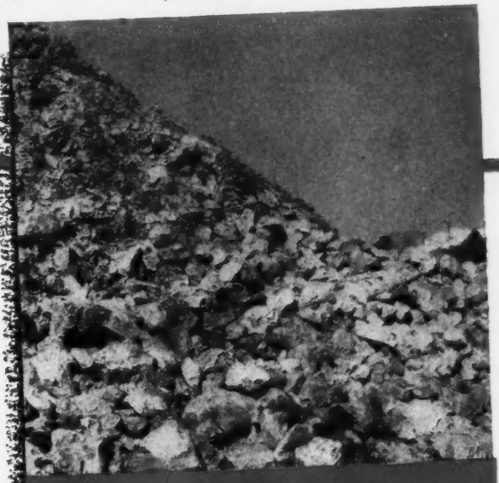
KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

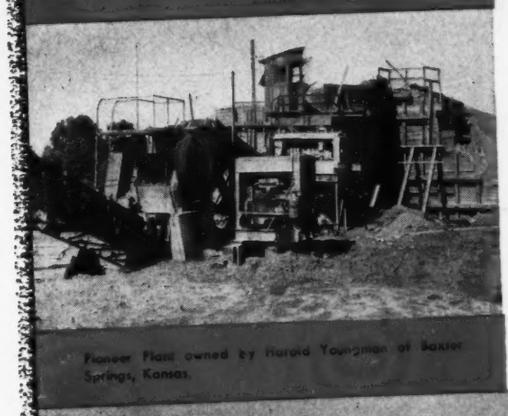
CRUSHING FLINTROCK

ONE OF THE HARDEST AND MOST ABRASIVE ROCKS IN THE WORLD

with PIONEER EQUIPMENT



Flintrock boulders, near Joplin, Mo. equalled in abrasiveness by only one known South African rock deposit



Pioneer Plant owned by Harold Youngman of Baxter Springs, Kansas.

Pioneer No. 56 Primary Crusher Unit—Travelling Grizzly Feeder and 2436 Primary Jaw Crusher.

● This is one of those interesting jobs that men who make their living in pit and quarry enjoy reading. It begins with the Santa Fe railroad which has recently installed new high-speed trains on its main line west of Kansas City. It was found that limestone ballast did not stand up under severe service.

Chats, which are rejects from lead and zinc mines near Joplin, Mo., were available, but their size was minus $\frac{3}{8}$" and too fine for ballasting the main line for high-speed trains.

Also available were great piles of flintrock which the mine operators had rejected as uncrushable. The mining section of W.P.B. advised that this rock was the most abrasive known in the U. S. and equalled only by one known rock deposit in the world located in South Africa.

Harold Youngman of Baxter Springs, Kansas, took the contract to crush this flintrock to $1\frac{1}{2}$" minus. The following PIONEER equipment is doing the job:

- a PIONEER No. 56 Primary Crusher, which consists of a Grizzly feeder and a 2436 Primary Jaw Crusher
- a PIONEER 1536 intermediate jaw crusher
- a PIONEER 48-V plant which includes a 1036 jaw crusher, a 40" x 22" roll crusher and a 4' x 12' vibrator screen.

Because of the extreme abrasiveness of the rock, it was found that better results could be obtained by using the four crushers and closing down the top opening on the jaw crushers, thus reducing the angle between the jaws and increasing the manganese life several times.

PUT IT UP TO PIONEER

You may never have a job like Mr. Youngman's, but whatever your job you'll want Pioneer equipment—the dependable equipment built with extra margins of performance for extra profits.

Pioneer
ENGINEERING WORKS
Jaw Crushers • Roll Crushers • Screens • Conveyors • Feeders • Washers

ENGINEERS and MANUFACTURERS of QUARRY-GRAVEL AND MINING MACHINERY

MINNEAPOLIS 13, MINN

SINCLAIR
OFFERS YOU THIS GUIDE TO
Better Lubrication

SENT FREE TO TRUCK AND BUS OPERATORS

"TRUCK and BUS LUBRICATION," a 40-page brochure, aims at better understanding and solution of lubrication problems in the truck and bus fields. It discusses such vital subjects as specific lubrication requirements . . . causes of motor oil deterioration in service, and preventive measures . . . characteristics of motor oils and greases, and proper selection for correct lubrication of parts.

• • •

This is a useful book to those directly responsible for vehicle operation, and a helpful book to owners. It makes possible savings in time, trouble and expense. Send for it.

SINCLAIR LUBRICANTS-FUELS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE **SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.**

These will always win for you

I-R WAGON DRILLS · JACKHAMERS · DRIFTERS · PAVING BREAKERS · PORTABLE COMPRESSORS

Deep-hole drilling power and unusual flexibility result from using FM-2 Wagon Mountings equipped with the sturdy X-71WD Drill.

More feet of hole per shift from I-R Jackhamers, with their easy holding, high drilling speed and durability. There is a size and type for every drilling problem.

Record-breaking performance on tunnel jobs prove the durability and drilling speed of I-R Power-Feed Drifters—3, 3½ and 4-inch sizes.

You break concrete faster with I-R Paving Breakers. The popular "Cushioned-Air" feature prevents the piston from hitting the fronthead. There's less shock, less breakage, and lower upkeep. Made in 40, 60, and 80-pound sizes.

You get Air Power at lower cost from the Mobil-Air Compressor—the portable with the Drill-More Regulator—sizes 60 to 500 cubic feet per minute.

ROCK DRILLS
AIR TOOLS
COMPRESSORS
CONDENSERS
TURBO BLOWERS
CENTRIFUGAL PUMPS
OIL AND GAS ENGINES

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

14-713

STILL YOUNG

At-45,000 hours

45,000 WORKING HOURS is the record of this old "Caterpillar" Diesel Forty Tractor. Owners: Baragar Bros., Contractors, Elm Creek, Manitoba. Used with bulldozer, scraper, blade and elevating graders—on road building and airport contracts, winter freighting, and general farm work. Owner says, "Does twice as much work—and at half the operating cost—as the tractor it replaced."

At-19,200 hours

19,200 WORKING HOURS is the record of this husky "Caterpillar" Diesel No. 11 Motor Grader. Owner: Pratt County, Kansas (R. A. Peterson, County Engineer). Used for grading, snow-plowing and general road maintenance. Mr. Peterson says, "Operates at 60% of fuel cost and does twice as much work as the equipment it replaced."

22,000 WORKING HOURS is the record of a Diesel Seventy-Five Tractor this progressive county owns.

As the hour-meters on "Caterpillar" Diesel Engines, Tractors and Motor Graders roll up work records of 20, 40 and even 50 thousand hours, the evidence of sound planning, correct engineering and quality manufacturing grows more and more impressive.

What were once considered unusual life spans in power equipment are rated today as "normal expectancies" in "Caterpillar" Diesels. It is when "outside" comparisons are made that their outstanding endurance and performances are fully appreciated.

Typical examples of the long, serviceable life of "Caterpillar" Diesels are pictured here. At the time their hour records were reported, the units were still "going strong" and, according to their operators, far from the end of their career.

CATERPILLAR TRACTOR CO.
Peoria, Illinois

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

The discharged veteran wears this emblem. Remember his service and honor him.

Athey Force-Feed Loaders

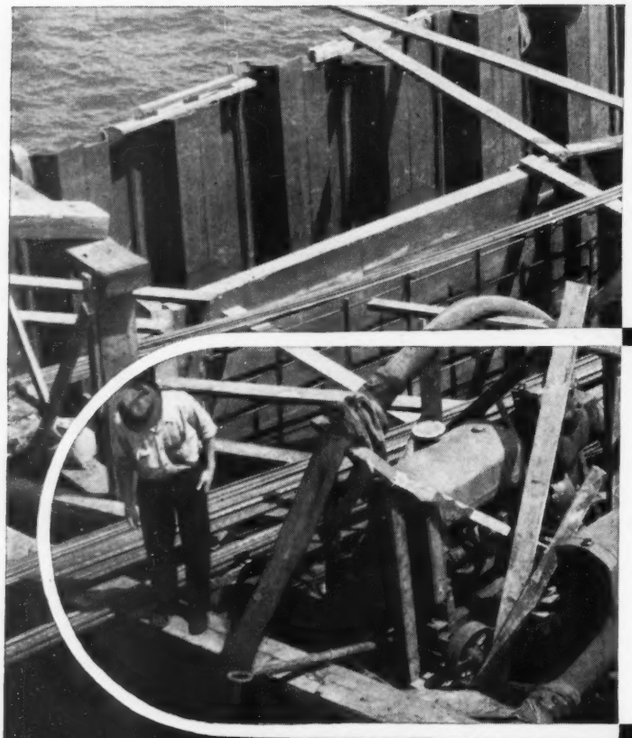
Athey Force-Feed Loaders are now at work in 33 States! Introduced at the outbreak of the War, production of this self-propelled highway maintenance loader was curtailed for essential military needs. Rolling off the line again, the Athey Loader has met enthusiastic praise from states, counties, cities and highway contractors from coast to coast. Your Athey-"Caterpillar" Dealer has complete facts — ask him today. ATHEY PRODUCTS CORPORATION, 5631 West 65th Street, Chicago 38, Illinois.

Athey
APCOR

DEPENDABLE LOADING & HAULING EQUIPMENT

Contractors pumps can't be

"CHOOSY"



They have to pump more than water – muck, weeds, sand, gravel and other solids. Gorman-Rupp self-priming centrifugals handle anything that comes their way for days, weeks, months at a time, if you want them to. And, they'll stand up. There's not a quitter among them! There's a big reason for this. The insides of a Gorman-Rupp are by far the simplest ever made – no small openings. No by-pass tubes, no sharp corners, no tricky valves. There's no place for refuse to stick or lodge. All internal passages are genuinely streamlined. Trouble is saved. Capacity stays up. Efficiency goes up. Repairs stay down. Thirty to sixty days without a stop and without harm to the mechanism is common with Gorman-Rupp Pumps. You can handle more water per hour, size for size of pump; more and bigger solids; with less trouble and up-keep; and with less fuel, when you do your pumping jobs with a self-priming Gorman-Rupp. We will place one in your hands and let you be the judge.

CAPACITY IN GALS. PER HOUR
with Pump 15 ft. above water

	TOTAL HEAD (incl. friction)			
MODEL	30 ft.	40 ft.	50 ft.	60 ft.
10-M	9000	7800	6600	4500
20-M	16500	15000	12600	9600
40-M	34500	33900	32700	30600
90-M	76800	73800	69600	63000
125-M	109200	104400	97200	90000

THE GORMAN-RUPP COMPANY

MANSFIELD, OHIO

Speed and Certainty with "SUPERSOCKETS"

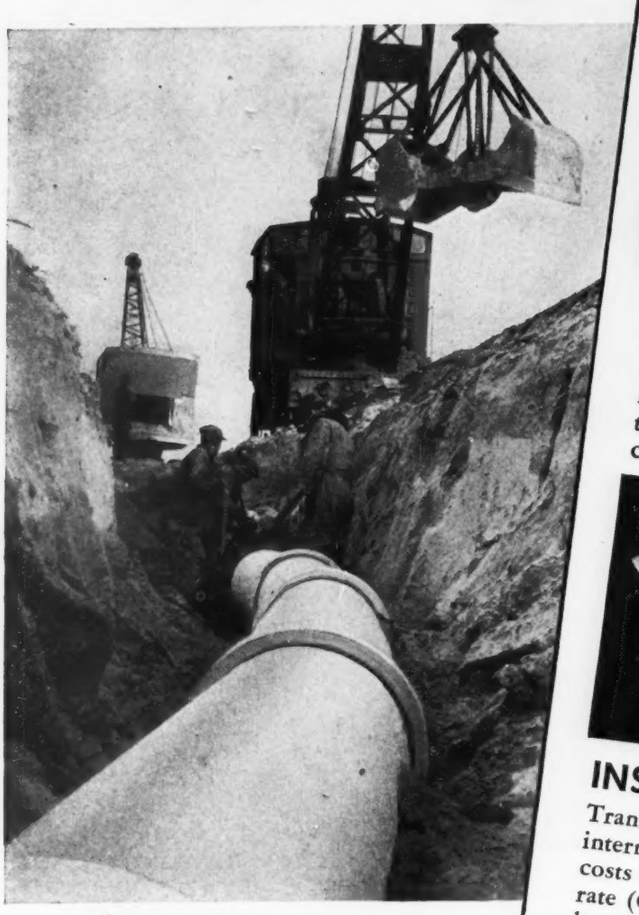
● There's a "Supersocket" wrench for practically every industrial need. The engineered flexibility of Williams "Supersockets" permits the combining of sockets, handles and accessories to create special wrenches for special jobs. "Supersocket" speed and surety will save job-time and reduce job-hazards. • Available in five different patterns, with drives ranging from 1/4" to 1" square, and with socket openings from 3/16" to 3-1/8". Williams "Supersocket" sets and parts are sold by Industrial Distributors everywhere.

J. H. WILLIAMS & CO., BUFFALO 7, N. Y.

WILLIAMS

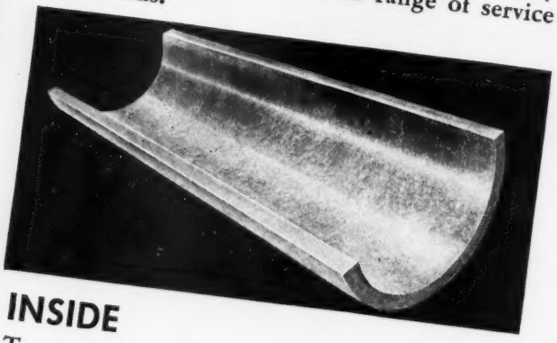
DROP-FORGINGS AND DROP-FORGED TOOLS

IT *RESISTS* CORROSION



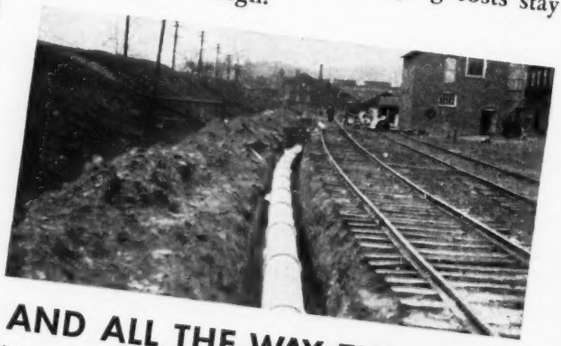
OUTSIDE

Transite Pipe is stubbornly resistant to soil corrosion. Thousands of successful installations, many of them in highly corrosive soils, testify to its stability under a wide range of service conditions.



INSIDE

Transite Pipe cannot tuberculate. This costly internal corrosion that increases maintenance costs can never choke off its initial high flow rate (C=140). As a result, pumping costs stay low, pressures high.



AND ALL THE WAY THROUGH

Transite Pipe resists destructive attack. Made of asbestos and cement bonded together under great pressure, its ability to provide efficient, economical water transportation has been proved in thousands of installations.

EASY HANDLING

is another advantage of Transite Pipe. Its light weight means more footage carried per truck load, fewer men required for handling, lower transportation costs. And in the trench, the Simplex Coupling assures quick, easy assembly, even with inexperienced crews.

For full details, write Johns-Manville, 22 East 40th Street, New York 16, N. Y.

JOHNS MANVILLE JM PRODUCTS

Johns-Manville ***TRANSITE PIPE***

FOR EFFICIENT, ECONOMICAL WATER TRANSPORTATION

Firestone TIRES-
Built for
TOUGH JOBS!

FIRESTONE Off-the-Highway tires are built to absorb the punishment of your toughest jobs. They're made to stay on the job longer with less time out for repairs.

Tread rubber on Firestone Off-the-Highway tires is tough... cut-resistant. Sidewalls are double-thick...a real protection against rutwear and snags. Four extra tread plies cushion and absorb impact blows. Cord bodies are made from the strongest rayon, Gum-Dipped for multiple strength.

Put Firestone Off-the-Highway tires on your equipment. Then watch your records. They'll tell a story of lowered costs and rising profits... proof of a good investment.

Listen to the "Voice of Firestone" every Monday evening over NBC network.

Firestone
OFF-THE-HIGHWAY TIRES

Copyright, 1945, The Firestone Tire & Rubber Co.

LOWER COSTS and a More Salable Product with TELSMITH

● The Hartland Sand & Gravel Co. of Hartland, Wis., is always on the alert to cut costs. Primary and secondary crushers of various makes were tried . . . without getting satisfactory economy. Then they got Telsmith Crushers—and results! Producing more aggregate in 8 months of 1944 than in all of 1943, all crusher trouble was eliminated.

When the 36″ Telsmith Gyrasphere Secondary Crusher replaced a 40 x 24 roll crusher and a reduction crusher—only half as much power was required. And not only was production increased but the product was better suited to the market.

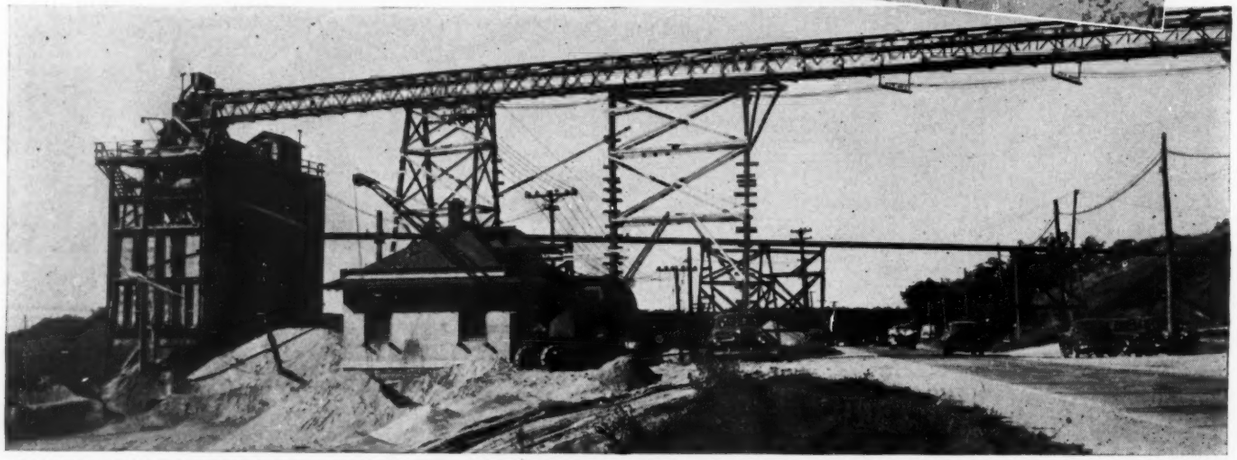
The plant's present output is about 130 tons of aggregate per hour, which runs approximately 60% rock and 40% sand. Three sizes of gravel and one size of stone chips, and mason and concrete sand are produced.

In addition to the No. 36 Telsmith Gyrasphere Secondary Crusher (*right*) other Telsmith equipment includes: 24″ Reciprocating Plate Feeder, Bar Grizzly, 13-B Primary Breaker, two 40″ x 14′ Heavy Duty Washing Screens and a No. 7 Sand Tank. This producer also operates several other aggregate plants in Wisconsin—all using some Telsmith equipment.

Modernizing, expanding, or planning a new plant—*consult Telsmith engineers.* Get Bulletin G-10.

G-12

No. 36 Telsmith Gyrasphere Secondary Crusher



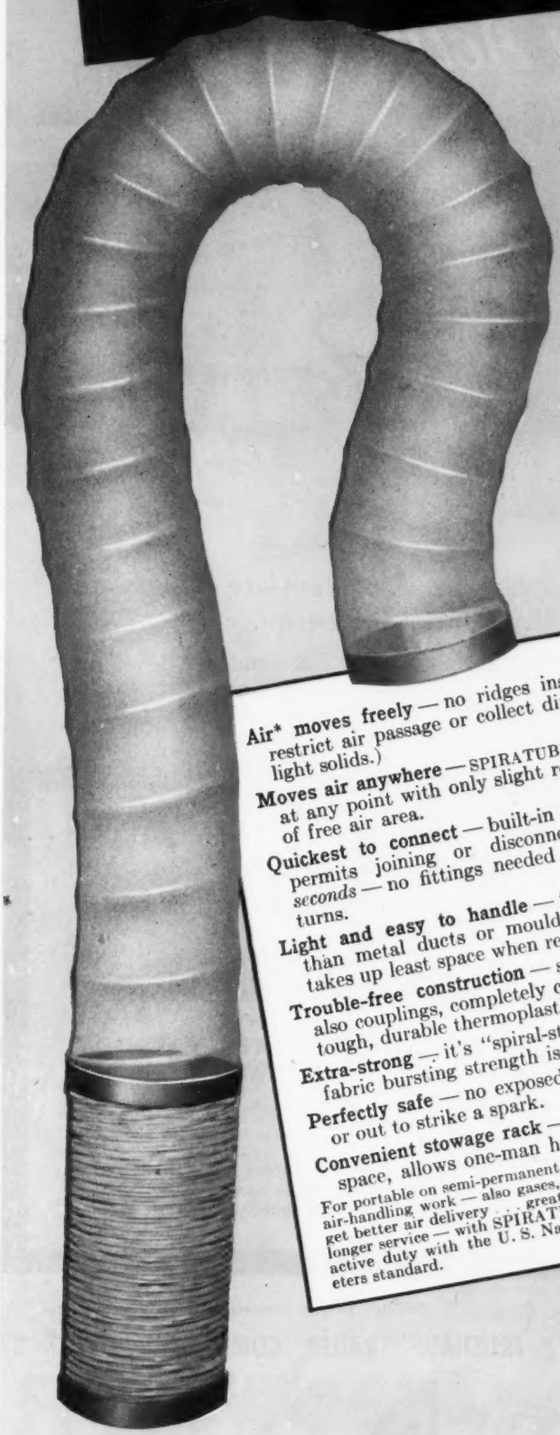
SMITH ENGINEERING WORKS, 510 E. CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

Cable Addresses: Sengworks, Milwaukee—Concrete, London

51 East 42nd St. New York 17, N. Y.
211 W. Wacker Drive Chicago 6, Ill.
713 Commercial Trust Bldg. Philadelphia 2, Pa.
247 Third Street Cambridge 42, Mass.
Boehck Eqpt. Co. Milwaukee 3, Wis.
Mines Eng. & Eqpt. Co. San Francisco 4—Los Angeles 14
Brandeis M. & S. Co. Louisville 8, Ky.
Rish Equipment Co. Charleston 22, & Clarksburg, W. Va.
Rish Equipment Co. Roanoke 7, & Richmond 10, Va.
North Carolina Eqpt. Co. Raleigh and Charlotte 1, N. C.
Wilson-Weesner-Wilkinson Co. Knoxville 8, & Nashville 6, Tenn.

EVERY ADVANTAGE YOU'D WANT IN...

Flexible Tubing



Air* moves freely — no ridges inside to restrict air passage or collect dirt. (*or light solids.)

Moves air anywhere — SPIRATUBE bends at any point with only slight reduction of free air area.

Quickest to connect — built-in coupling permits joining or disconnecting in *seconds* — no fittings needed for sharp turns.

Light and easy to handle — far lighter than metal ducts or moulded tubing; takes up least space when retracted.

Trouble-free construction — spring core, also couplings, completely covered with tough, durable thermoplastic.

Extra-strong — it's "spiral-stitched" . . . fabric bursting strength is 170 psi.

Perfectly safe — no exposed metal inside or out to strike a spark.

Convenient stowage rack — saves storage space, allows one-man handling.

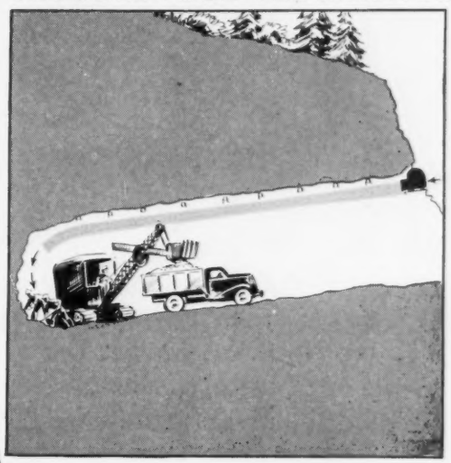
For portable or semi-permanent ventilation or any air-handling work — also gases, light solids — you get better air delivery . . . greater convenience . . . longer service — with SPIRATUBE . . . proved in active duty with the U. S. Navy. 3" to 16" diameters standard.

Send the coupon right away for specification folder. The Warner Brothers Company, Bridgeport, New York, Chicago, San Francisco. Address The Warner Brothers Company, SPIRATUBE DIVISION, Bridgeport 2, Connecticut.

NON-COLLAPSIBLE—RETRACTABLE

New construction principle. SPIRATUBE springs to work . . . stays extended . . . makes sharp turns . . . retracts to approximately 1/8 extended length . . . and gives you the exclusive features shown at left.

TROUBLE-FREE VENTILATION



Warner

SPIRATUBE*

*REG. U. S. PAT. OFF.

Spiral-Stitched for Strength

Mail Coupon Today for more detailed information

The Warner Brothers Company
SPIRATUBE DIVISION
329 Lafayette Street, Bridgeport 2, Conn.

Gentlemen: I'm interested to learn more about SPIRATUBE. Please send specification folder.

Name.....

Company.....

Address.....

THIS FRUEHAUF . . . .

25 Years Service Still on Active Duty!

Turner Cartage Company, of Detroit, makes good use of Fruehauf equipment. Their business is moving heavy machinery and materials of every description.

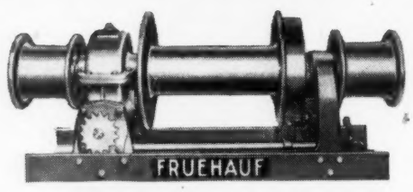
This Pole-Trailer, a veteran of a quarter of a century, is shown in service loaded with a 103-ft. beam for a new 25-ton Northern Crane. The mammoth piece of steel is shown leaving the Northern shops for delivery to the Cadillac Motor Car Company, Detroit.

Handle Tough Jobs Easily

Hauling long, heavy poles, massive structural beams, steel piling, construction machinery—it's all in a day's work for Turner. But unfailing service of the equipment that must handle these tough jobs quickly is an important factor that's best considered when the purchase is made.

Turner executives will tell you that Pole-Trailers, big Carryalls and the Flat-Beds in their fleet are all a credit to Fruehauf engineering.

Call in the nearest Fruehauf man. Let him help you with your hauling plans. This service costs you nothing extra and may save many dollars for you in the long run.



FRUEHAUF WINCHES PROVIDE NEW SAFETY IN POWER LOADING!

3 Models { 12,000 lb. capacity; 18,000 " "; 25,000 " "

Write for full particulars about ease of operation and safety features of these new winches, or visit your nearest Fruehauf Branch!

World's Largest Builders of Truck-Trailers

FRUEHAUF TRAILER COMPANY, DETROIT 32

Service in Principal Cities

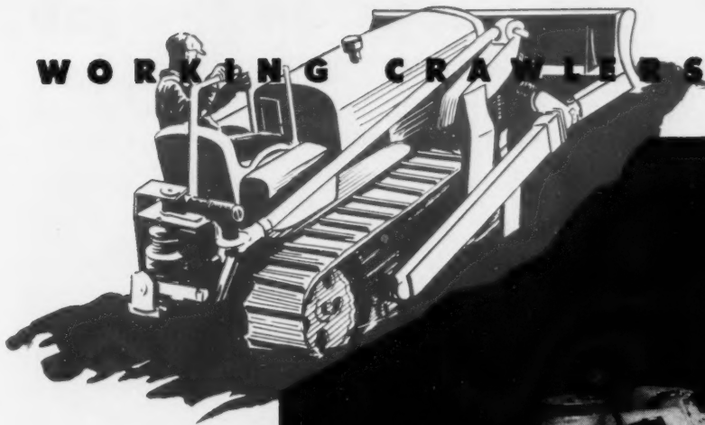
FRUEHAUF TRAILERS

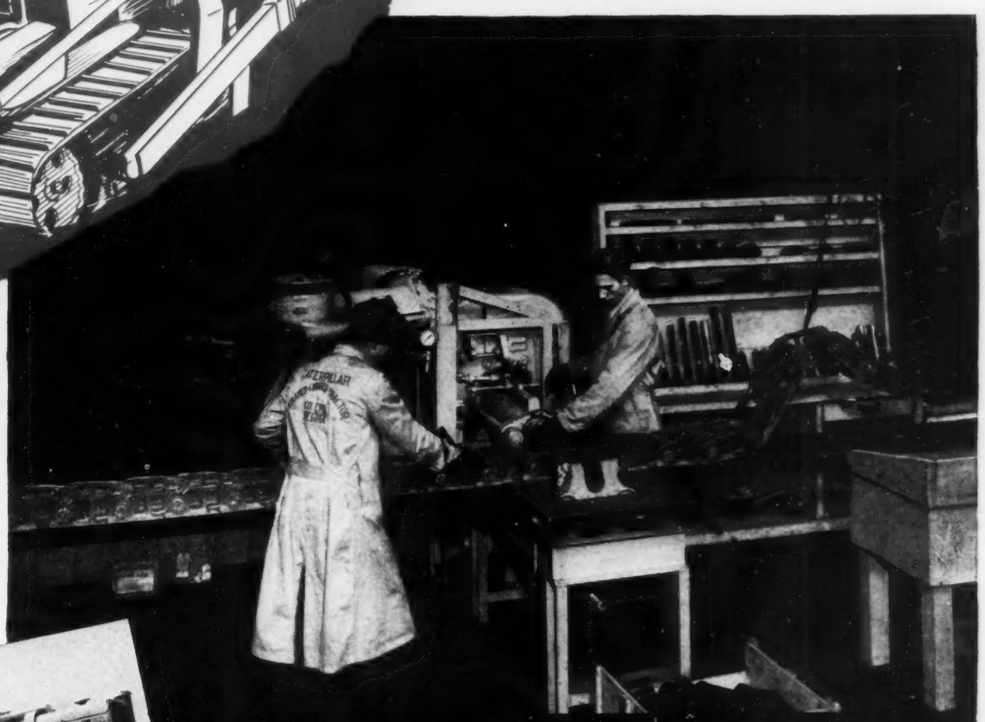
A TRUCK IS LIKE A HORSE — IT CAN *PULL* MORE THAN IT CAN CARRY

"Engineered Transportation"

REG. U. S. PAT. OFF.

WORKING CRAWLERS EARN MONEY..





stationary

portable

bad track doesn't mean "days off"

when there's a Rodgers around-

RODGERS CRAWLER TRACK PRESSES

Mr. Contractor

Your dealer probably has Rodgers Track Servicing Presses in his service department for the purpose of helping you maintain your equipment. If he hasn't and your requirements won't justify your having a Rodgers Press of your own, urge him to investigate the savings of a Rodgers. It will pay you both!

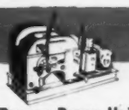
You don't need to "retire" your crawler equipment for a couple of days for track maintenance . . . you don't need a gang, or a sledge, or a torch either — no Sir! — not when there is a Rodgers Track Press on or near the job. That's because a Rodgers will service 2 large strings of track in the average machine time of 3 to 4 hours.

A Rodgers has an exclusive feature in the Retractable Jaw which eliminates lifting the track over a stationary jaw and assures proper bearing support against the inner side of the rail, thus properly spacing the rails, eliminating any binding action — leaves tracks flexible after servicing. And the Rodgers Track Wrench is the handy answer to tight, frozen nuts.

You can get a Rodgers Crawler-Track Press in portable models: 2 wheel trailer or 4 wheels; and in stationary shop models. Write now for complete details; or see your crawler equipment dealer — he will tell you what a Rodgers can do to save you time and labor.

Rodgers Hydraulic, Inc.

hydraulic power equipment



Shop Presses

Crawler-Track Presses

7403 Walker St., St. Louis Park, Minneapolis 16, Minn.

Power Pump Units

Portable Presses

Hard working hand that keeps on the job

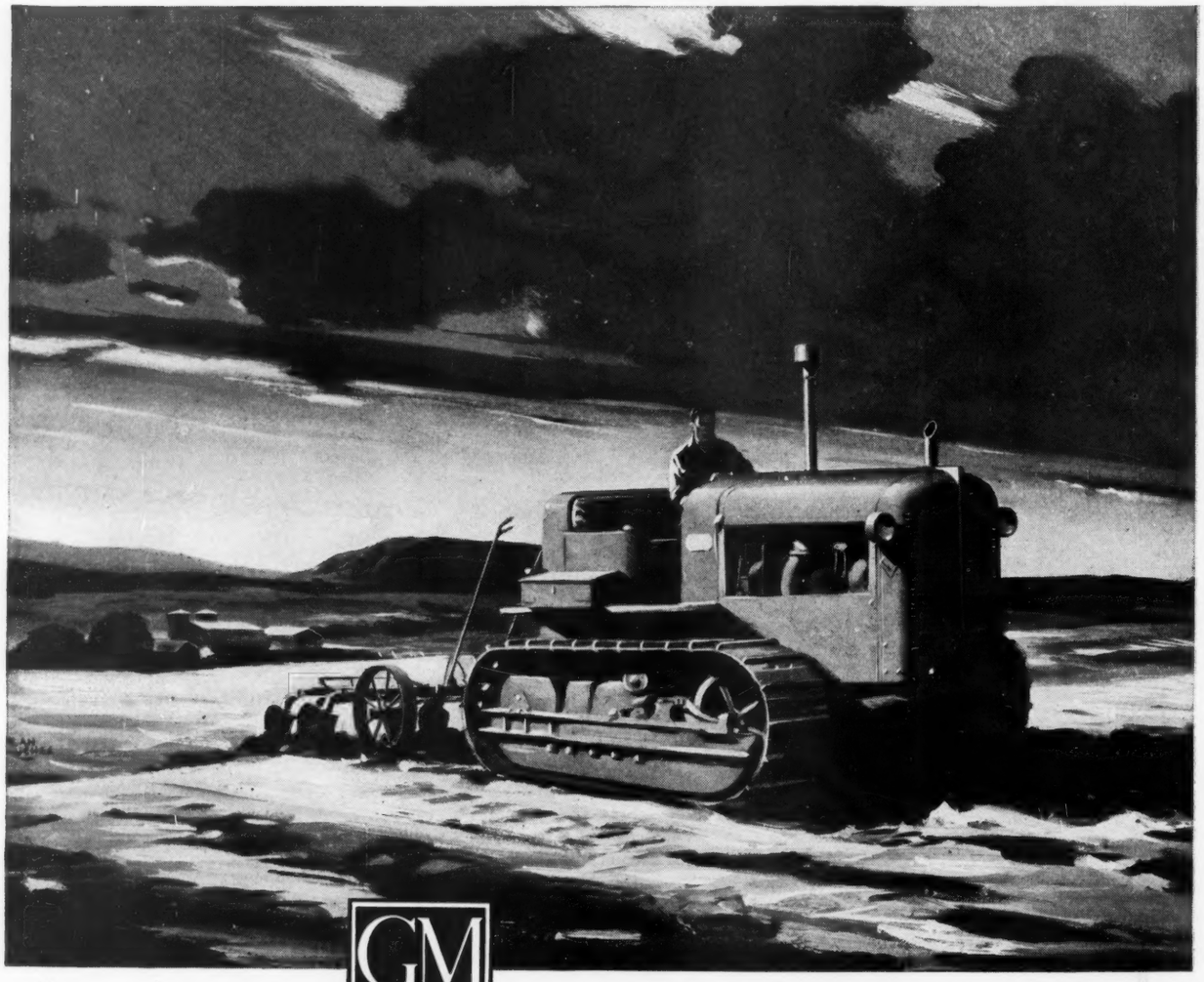
How hard a tractor can work, and how long, rests largely with its engine. Drawbar pull is heavy. Strains are great. And the job must go on day in and day out.

It's right here that General Motors Series 71 Diesels shine. Both in peace and at war they have built rare records of performance. Already many of them in tractors have delivered up to 25,000 hours of economical performance and are still going strong.

Farmers and construction engineers like them especially because they deliver great power with less than usual size and weight. They start fast and are easy to service. And replacements when needed are readily available because of GM simplified design and because elimination of *different* sizes of parallel parts increases the availability to owners of the right part *when it is needed.*

The successful example of GM Diesel power in tractors indicates its value in other products such as lumber carriers, "special" trucks —in all forms of marine power requirements —in all forms of contractors' and road machinery—in welders—in mining and pumping—in any tough industrial job.

During five years on the Arena-Norton farm, largest vegetable shippers in Arizona, an Allis-Chalmers tractor like this, powered by a GM Diesel, has operated 18,186 hours, day in and day out. This 3,200-acre farm now employs four of these tractors.



KEEP AMERICA STRONG
BUY VICTORY BONDS

GM
GENERAL MOTORS
DIESEL POWER

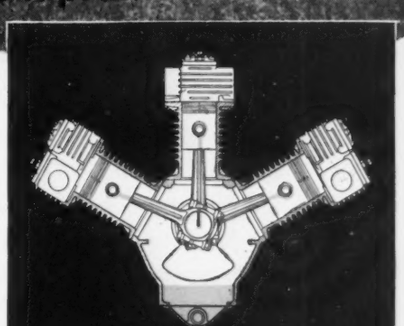
SINGLE ENGINES . . Up to 200 H.P.
MULTIPLE UNITS . . Up to 800 H.P.

DETROIT DIESEL ENGINE DIVISION, Detroit 23, Mich.

AIR PLUS JAEGER COMPRESSOR

Quiet Please!-Tobacco Asleep
25 Million pounds of finer, lighter, naturally milder
tobacco aging here for Lucky Strike cigarettes
JAEGER
ATLANTIC BITULITHIC CO. WASHINGTON
THIS QUIET
COMPRESSOR DOES ITS JOB AT
20% TO 30% SLOWER PISTON SPEED (800 f. p. m.)

Because they are precision built and balanced, and develop full efficiency at slower piston speed, Jaeger "AIR PLUS" compressors are much quieter and cooler running, deliver more air per pound of fuel with less wear on engine and compressor. Fuel tank is recessed and protected inside the main frame, permitting use of 30% to 50% larger air receivers for less frequent engine acceleration, further fuel economy and cooling of the air . . . These are some of the reasons why compressor users are demanding "AIR PLUS." Ask for complete Catalog JC-5.



Compressor unit is a balanced "W" with interchangeable precision parts, micro-honed cylinders, force feed lubricated thruout.

THE JAEGER MACHINE CO., Columbus 16, Ohio

REGIONAL OFFICES:	8 E. 48th St. NEW YORK 17, N. Y.	226 N. LaSalle St. CHICAGO 1, ILL.	235-38 Martin Bldg. BIRMINGHAM 1, ALA.

"FLEET-FOOT" LOADERS

"SPEEDLINE" MIXERS

"SURE-PRIME" PUMPS

"AIR-PLUS" COMPRESSORS

JAEGER *Engineered* EQUIPMENT

JAEGER-LAKEWOOD SPREADERS, FINISHERS AND BITUMINOUS PAVERS, FORMS, FORM TAMPERS—"DUAL-MIX" TRUCK MIXERS, AGITATORS—JAEGER HOISTING ENGINES, TOWERS

THEY'RE HERE!

THEY SET A NEW HIGH IN

Only Crawler-Drawn Scrapers *Built that give you* All *these* Profit-Making *Advantages*

EASIER LOADING—Because LaPlant-Choate's new "floating" front apron provides a generous initial opening, without any movement of the tail gate. Moreover, LPC's curved bowl design, smooth interior and special offset cutting edges provides better penetration, enables the operator to balance his tractor power better, and assures a continuous "fountain action" of earth toward the center of the bowl. In addition, exclusive egg-shaped hoist sheaves enable the operator to "pump" sand and other loose material into the bowl with amazing ease.

EASIER HAULING—Thanks to lower draft, shorter wheel base and elimination of unnecessary dead-weight, these new "Carrimors" enable you to utilize every ounce of tractor power to best advantage in handling maximum pay loads.

FASTER, CLEANER DUMPING—Because LaPlant-Choate gives you positive forced ejection *PLUS*. Rear gate not only bulldozes all material out of the bowl but the front apron moves ahead and out of the way at the same time, so there's no danger of jamming sticky material between the gate and apron. Moreover, you get full capacity loads every trip because the tail gate is positively returned the full distance by the weight of the apron.

GREATLY IMPROVED SPREADING—You can really carry a uniform spread with these new "Carrimors"—and at consistently higher speeds—because the cutting edge is positively controlled and completely independent of other moving elements.

GREATER STABILITY—Low center of gravity and freedom from bulky overhead structures mean faster, safer operation with less danger of over-turning or jackknifing on steep fills or rough terrain.

GREATER UTILITY—Because LPC's wide, open top bowl also permits overhead loading with shovel drag-line, or bin. It also eliminates "under-pass worries" when hauling from one job to another.

New

LaPLANT-CHOATE CARRIMORS

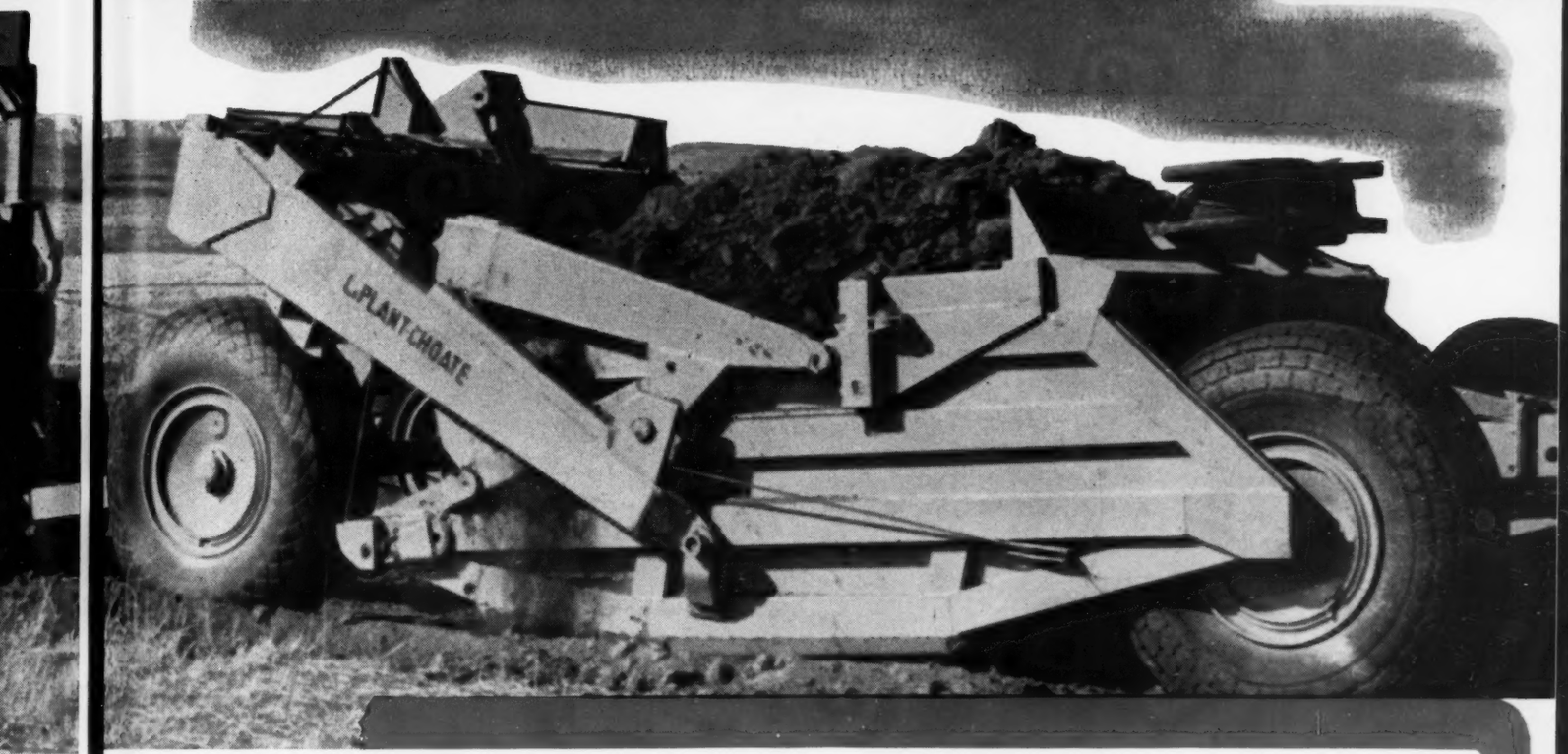
IN 8 AND 14 YARD SIZES

Watch for More Great News About the New LaPlant-Choate Line!

This is the first in a series of important announcements designed to bring you pertinent facts about LaPlant-Choate's great new earthmoving line—including many new and outstanding developments in cable and hydraulic operated scrapers, hydraulic dozers, cable and hydraulic power control units—plus a new "surprise" in high speed, big capacity earthmoving rigs. So before you start lining up new equipment for tomorrow's jobs, be sure to see the new LPC's—created by LaPlant-Choate's extensive war-time experience and "seasoned" by over a third of a century of engineering and manufacturing "know-how".

THEY'RE JOB-PROVED!

EARTHMOVING PERFORMANCE



Here, at last, is a new positive forced ejection scraper—available in 8 and 14-yard struck capacities—that combines all the good points of other rigs *and a whale of a lot more besides.* Developed by LaPlant-Choate engineers and thoroughly proved on hundreds of tough earthmoving jobs from coast to coast, these greatly improved "Carrimors" are already demonstrating their superior performance under a wide variety of conditions. But don't take our word for it. Ask to see the new LPC's in action. Then you'll see why so many agree on LPC for *lowest possible cost per yard*—wherever crawler-drawn scrapers are indicated. LaPlant-Choate Manufacturing Co. Inc., Cedar Rapids, Iowa. San Leandro, California.

You get big heaping loads faster and with less power with the new LPC "Carrimors" because every feature—blade angle, heel clearance, bowl design, hoist sheaves and apron operation—has been scientifically engineered to gain every possible advantage in loading.

At the dump you profit even more with a "Carrimor" because LaPlant-Choate's exclusive high lifting front apron moves ahead with the tail gate, thus assuring quick, positive ejection of the entire load—including mud and gumbo—without jamming or sticking.

LaPLANT CHOATE

EARTHMOVING AND LAND CLEARING EQUIPMENT

LOWEST POSSIBLE COST PER YARD

First WITH HYDRAULIC DRIVE

Joseph Keel, Rental Equipment Co., Missouri—Used a hydraulic drive Lorain 82 in gumbo and sand constantly for 4 years, says, "We have operated 7 makes of draglines and my honest opinion is that Lorain tops them all!"

La Clede Christy Brick Co., Missouri—At last report a year ago had piled up 8,000 hours in 2 years on a hydraulic drive L 82—4 years' work in 2—and still going as strong as ever.

Liberty Limestone, Virginia—Four years, 9 hours a day, 26 days a month—rock all the way—reports, "Simple, durable and satisfactory!" Has purchased a second L 82 to prove it!

LOOK AT THIS RECORD...

Contractors Service Corp., Pennsylvania—handled 3,000,000 tons of rock a year with 5 Lorain 82's—50,000 tons a month per shovel for 12 months straight!

...AND STILL FIRST AFTER 5 YEARS!

There's no substitute for experience! And today when hydraulic drive is just coming into its own in construction equipment, Thew—who pioneered it in the shovel and crane field—can offer you tested hydraulic coupling equipped machines with 5 years of tough concentrated field work behind them!

Here—in the 2-yard Lorain 82—is hydraulic drive at its peak. You can't shock this shovel. Slam the dipper into the pile or tie into the biggest rock and the Lorain-engineered hydraulic coupling absorbs shocks and strains—reduces maintenance by lengthening machinery life. Not only that! The power hangs on like a bulldog till the rock is in the dipper—the engine never stalls.

Hydraulic drive plus Thew Center-Drive direct-to-the-point turntable power application; two speed chain drive crawler; all-steel, all-welded boom; all-steel dipper stick and new, one-piece, streamlined dipper make the "82" ideal for rock and other tough work.

Hydraulic drive can save you plenty! Be sure you get it at its *tested* best—in a proven Lorain 82. Ask your Lorain distributor for details today.

HYDRAULIC DRIVE STANDARD ON ALL LORAIN 82's AT NO EXTRA COST

Reg. Trade Mark

thew-Lorain

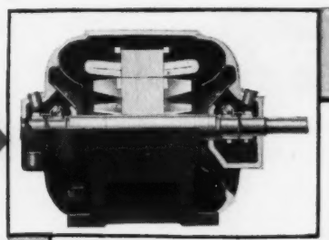
THE THEW SHOVEL CO.
LORAIN, OHIO

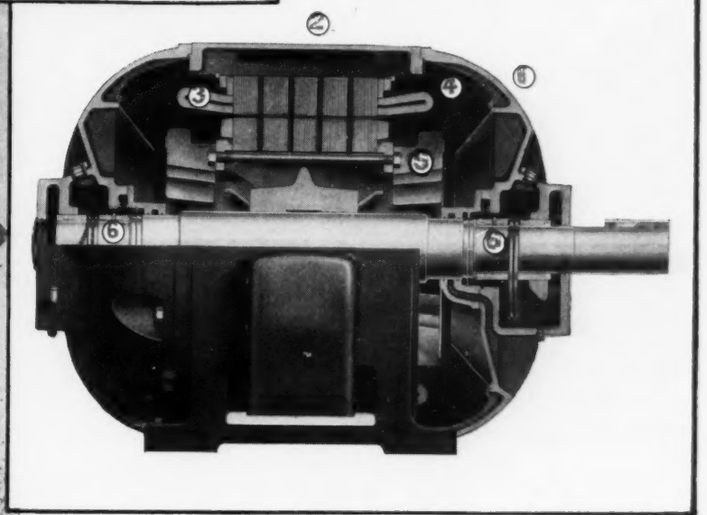
CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

SAME STRONG POINTS OF CONSTRUCTION

from 1 hp

to 2000 hp





Now all your drives — large and small — can have standard G-E Tri-Clad induction motors with the famous protective features that guard against PHYSICAL DAMAGE, ELECTRICAL BREAKDOWN, OPERATING WEAR AND TEAR.

Tri-Clad, in its wide range of types and sizes (recently increased to 2000 hp), is G.E.'s most widely used (integral-hp) motor. For complete details on ratings, characteristics, and dimensions, write for Bulletin GEA-3580. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

HERE'S TODAY'S WIDER RANGE OF STANDARD SIZES	
Tri-Clad Type K (Low starting current, normal starting torque)	1 hp to 2000 hp at 1800 rpm
Tri-Clad Type KG (High starting torque, low starting current)	5 hp to 200 hp at 1800 rpm
Tri-Clad Type KR (High starting torque, high slip)	Available to 100 hp in speeds required for high-slip flywheel drive (punch press, etc.)

1. Cast-iron frame and rigid, cast-iron end shields protect the motor from external blows and accidental abuse.
2. Completely enclosed upper portion of frame guards against entry of falling objects and dripping liquids; keeps chips and the like from vital motor parts.
3. Windings of Formex* wire—one of the toughest magnet wires yet developed—resist heat aging, heat shock, and abrasion.
4. End windings are coated with Glyptal* varnish, providing a tough, hard finish that withstands moisture, oil, and abrasion.
5. Low-velocity, double-end ventilating system keeps the motor running cool and prolongs insulation life. One-piece, cast-aluminum rotor (used on all but the largest sizes), with integrally cast fans, is practically indestructible.
6. Bearings have extra capacity to take heavy shaft loadings from any direction. Lubrication is convenient, its effectiveness well proved.

*Trade-mark reg. U. S. Pat. Off.

TRI CLAD MOTORS

Buy all the BONDS you can — *and keep all you buy*

750-266-8030

GENERAL ELECTRIC

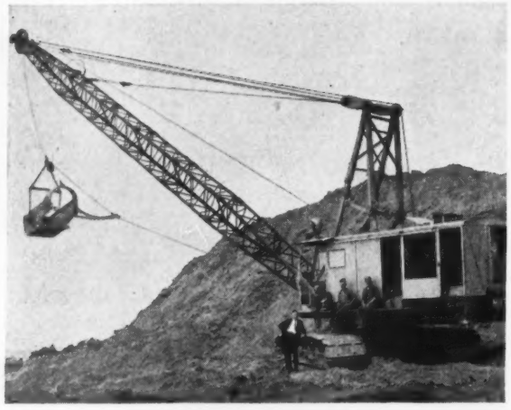
How to Move MORE CUBIC YARDS

. . . at lower cost

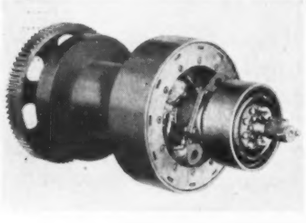
Experience has proved that shovels, cranes, dredges and draglines equipped with Fawick Airflex Clutches give you new *full-time* operating efficiency.

1. These clutches absorb torque, shock and vibration, and transmit power through a cushion of air.
2. They have no arms, springs or levers to break, wear out or get out of adjustment.
3. They require no lubrication—maintenance costs are unusually low.
4. Their flexible cushioning action protects *both* motor and mechanism.

The RESULT—more hours of effective service—fewer breakdowns—more material moved—at lower cost per cubic yard.

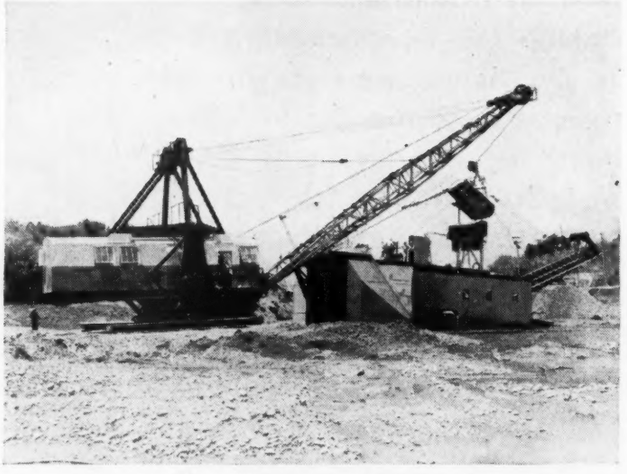


Fawick Clutches are providing new efficiency for shovels, cranes, draglines and hoists.



◀ Seven Fawick Clutches are used on the Byers ½ cu. yd. "Traveler."

◀ Hoist drum assembly of the shovel above — Fawick equipped.



Marion dragline, equipped with Fawick Swing Clutches.

Write us for complete data, and recommendations engineered to suit your equipment. Book on request.

ARMY-NAVY "E"

FAWICK *Airflex* CLUTCH

FAWICK AIRFLEX CO., INC. • 9919 Clinton Road, Cleveland 11, Ohio

In Canada, Reynold-Coventry Ltd., Montreal, Toronto, Vancouver • In Britain, Crofts Engineers, Ltd., Bradford, England

BUILT to outperform

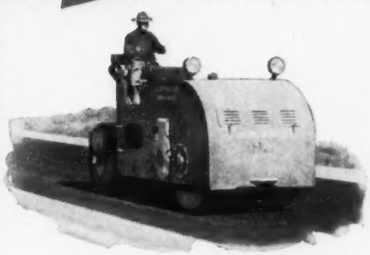
Exclusive features that save time and money by getting the job done better and quicker. "Plus values" built into every Austin-Western machine . . . values accumulated by engineering experience that has lived close to road building and earth moving problems and practices since the first crude Austin-Western tools of 1859.

Features of design and construction "job tested" before the war . . . that met the acid test of service on far-flung war fronts.

More than ever your post-war Austin-Western machine is "Built to Outperform".

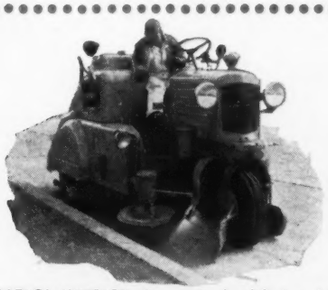
AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U. S. A.

MOTOR GRADERS—Exclusive All-Wheel Drive and All-Wheel Steer enables the "99-M" and "88-M" completely to outperform ordinary motor graders.

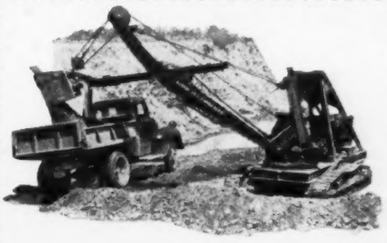


TANDEM ROLLERS—Made in 2 sizes—5 to 8-Ton and 8 to 10½-Ton. The variable weight feature enables one machine to handle a wide variety of jobs.

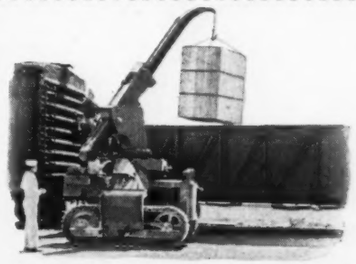
3-WHEELED ROLLERS—Made in sizes ranging from 6 to 12 tons. Gasoline or diesel engines. Hydraulic power steer. Hydraulic scarifier attachment.



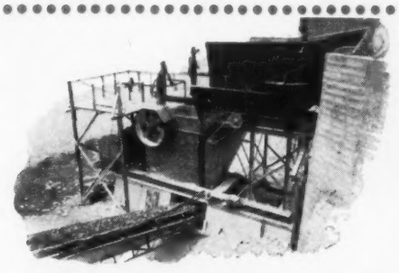
PATROL SWEEPER—Compact, simplified, quick-dumping. Rear broom throws dirt directly into hopper. May be had with Leaf Broom attachment.



BADGER SHOVEL—Convertible to crane, dragline, piledriver, trench hoe, and skimmer. ¾-swing design has many operating advantages.



HYDRAULIC CRANE—Retractable-extensible boom provides ability to lift and carry maximum load under such handicaps as low doors and ceilings, inside box cars, etc.



CRUSHING EQUIPMENT—Roller bearing jaw crushers and roll crushers in a wide variety of sizes. Portable and semi-portable crushing and screening plants for all purposes.

TRAIL CARS—Hopper-bottom and side-dump types. Designed for heavy duty haulage behind powerful truck-tractors, in open pit mines, quarries, etc.

DUMP CARS—Side-dump models built in capacities up to 50 yds. (level full), and 90 tons; in standard, narrow and foreign track gauges. Also hopper type, bottom-dump cars.

ARMY E NAVY

BUILDERS OF ROAD MACHINERY

Austin A Western

SINCE 1859

BUY MORE WAR BONDS

GO where the profits are!

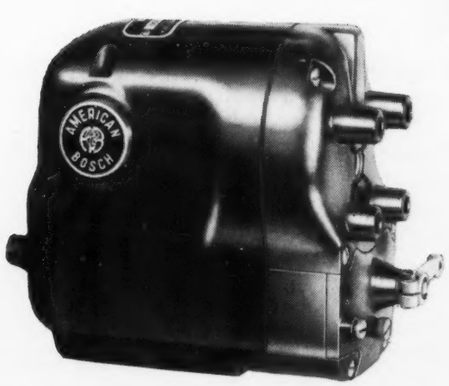
With a BAY CITY CraneMobile there's no waiting for excavating and other material handling jobs to come your way. You're fully mobile—and convertible too. Your CraneMobile will take you anywhere in a wide working area for bigger profits. Husky, dependable construction, with all the BAY CITY long life, easy-operating advantages. Available in several models and capacities, with road speeds up to 30 M.P.H. Illustrated is one of two 10-ton capacity CraneMobiles delivered since V-J Day to John Edward, Inc., excavators and crane renters of Toledo, Ohio. Especially valuable for erection work, this model will handle a 75 ft. boom with jib. For complete information on how the CraneMobile will bring you greater profits by increasing your working area, see your nearest BAY CITY dealer, or write direct to BAY CITY SHOVELS, INC., Bay City, Michigan.

BAY CITY

SHOVELS • DRAGLINES
CRANES • HOES • CLAMSHELLS

SEE YOUR NEAREST DEALER for Bay City excavating and material handling equipment in sizes from ⅜ to 1¼ yards having crane rating up to 20 tons. Both crawler and pneumatic tire mounting.

Portrait of a Spark



American Bosch Magnetos have served with distinction on many of our greatest warplanes and in more than 25 other military applications. *They are available today for agriculture, construction and other domestic uses.*

It is important to *know* that each individual spark in the power stream that flows from an American Bosch Magneto is the right *kind* of spark for top engine performance.

Here, an American Bosch technician uses a cathode-ray oscillograph to "paint the magneto's performance portrait." From the screen he is able to determine its characteristics of current, voltage and spark length and to forecast its performance in actual use.

Making sure is inherent in Precision Production for Power. A combination of traditional craftsmanship and specialized engineering knowledge attends every production step. The resultant reliability of American Bosch products is further backed up by a world-wide maintenance organization.

AMERICAN BOSCH CORPORATION
Springfield 7, Massachusetts

AMERICAN BOSCH

AUTOMOTIVE AND AVIATION ELECTRICAL PRODUCTS • FUEL INJECTION EQUIPMENT

"TOUGHEST JOB

SLOPE STABILIZATION ON DELAWARE CANAL

▲ *To get heaping loads every trip, Hendrickson Bros., Inc. used a snatch tractor in the soft cut . . . occasionally added a second, as a pusher, when Tournapulls uncovered a slide pocket.*

. . SAYS ART HENDRICKSON HENDRICKSON BROS. INC.

Hendrickson Bros., Inc. of Valley Stream, Long Island, used Tournapulls to lick a dirtmoving job that has been a contractor's nightmare ever since the original building of the Chesapeake & Delaware Inland Waterway Canal.

430,000 YARDS HAULED UPHILL

Job involved moving 430,000 yards uphill to cut back a 100′ high, soft, caving bank on a 2000′ section of the Delaware Canal. This required building a 3-step stabilized slope . . . each step, 20′ wide by 35′ high with 2½ to 1 slopes.

Hendrickson Bros., Inc. moved in their Tournapulls and other LeTourneau rigs last December 20th, started mucking out the partly frozen ground immediately. Tournapulls stayed on the job . . . profitably handled 60% of total yardage . . . proved their ability to overcome the handicaps of soft and treacherous material, stiff haul grades and extreme weather conditions.

MUCK BANK . . . SOFT, TREACHEROUS MATERIALS

Material consisted of coarse sand, fine sand, clay, black silt and other materials, pocketed in unpredictable formations due to previous slides . . . wet to the point of saturation . . . tough to load and about as poor a foundation for haul roads as you'll ever find.

8 TO 12% ADVERSE HAULING GRADES

Every yard of material had to move uphill . . . haul road grades ran from 8 to 12% and were successfully negotiated by the Tournapulls carrying full capacity loads. Hauls ran from 1300 to 1800′ one way.

▶ **Material on the dump was so saturated and unstable that the area was always tough going throughout the entire job. Under the most severe conditions a Dozer was used to speed spreading.**

IN 20 YEARS"

▲ Pulling out of the cut, Tournapull hauls heaping load of silty sand along soft, treacherous sloughing bank of Chesapeake & Delaware Canal.

WET WEATHER . . . WINTER OPERATION

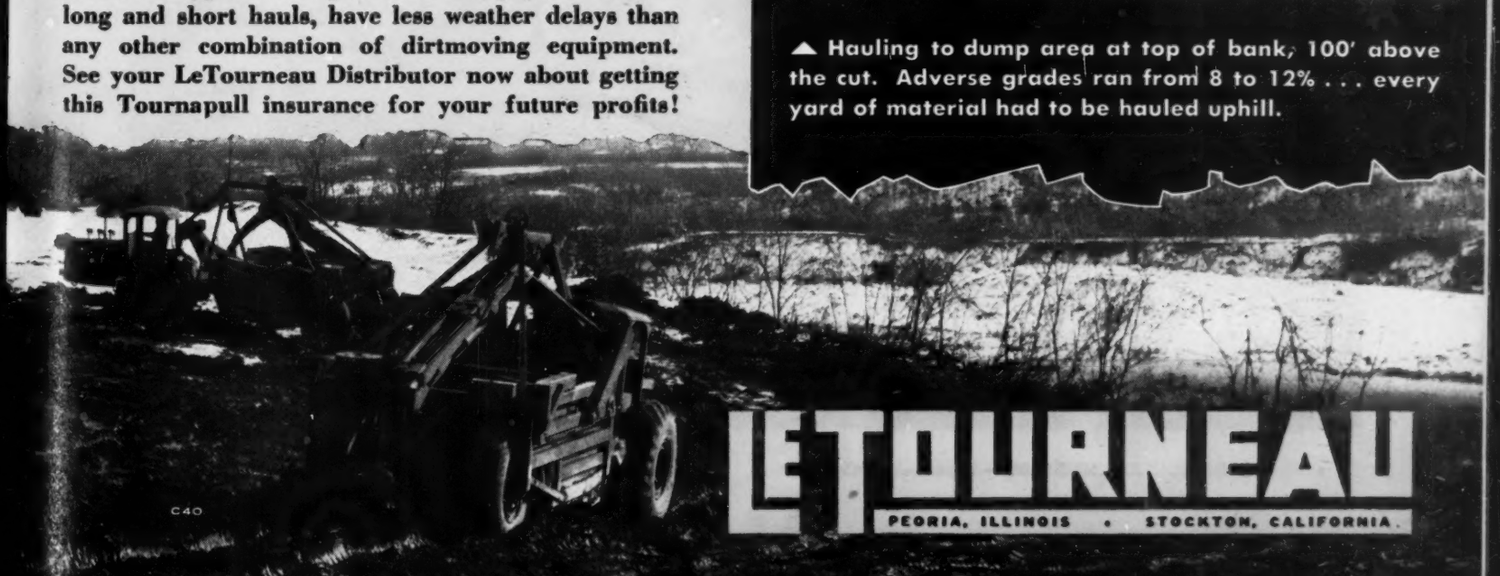
Weather on this job made dirtmoving conditions about as rough as they come . . . wet, cold and raw . . . freeze and thaw . . . rain and freeze. In 6 months there was never a long enough spell of sunshine to dry more than a thin skin over the water soaked muck.

TOURNAPULLS on the JOB ALL THE TIME

In spite of tough conditions, Hendrickson Bros., Inc. completed the job in six months. Their 5 Tournapulls stayed on the job from start to finish . . . handled 60% of the total dirt. The exceptional ability of the Tournapulls on this job led Hendrickson to order 3 additional Tournapull rigs.

When you equip with Tournapulls you insure against any conditions the future may bring. Tournapulls handle all types of scraper materials, pay out on both long and short hauls, have less weather delays than any other combination of dirtmoving equipment. See your LeTourneau Distributor now about getting this Tournapull insurance for your future profits!

▲ Hauling to dump area at top of bank, 100' above the cut. Adverse grades ran from 8 to 12% . . . every yard of material had to be hauled uphill.



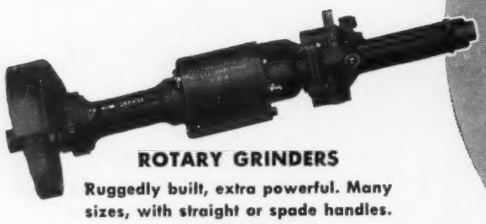
C40

LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

CLECO TOOLS

for
TODAY'S JOB
and
TOMORROW'S



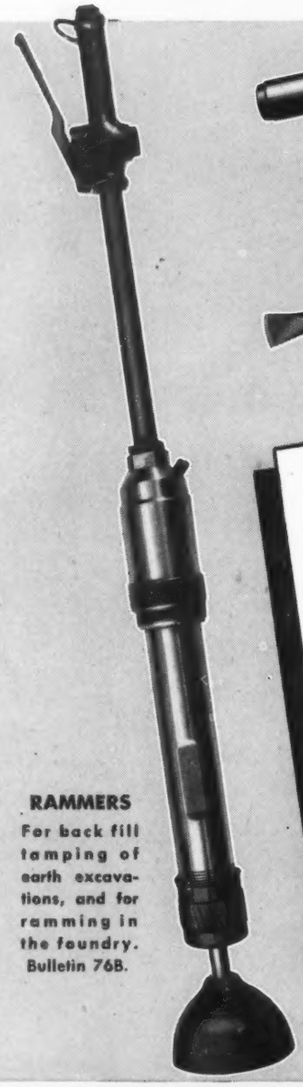
ROTARY GRINDERS
Ruggedly built, extra powerful. Many sizes, with straight or spade handles. Bulletin 80.

RIVETING HAMMERS
For heavy duty work with hot rivets. Three styles of handles. Bulletin 82.

RIVET BUSTER
To cut off rivet heads, break down walls, drive spikes and small drift bolts. Bulletin 82.

WIRE BRUSHING TOOLS
Husky rotary machines, used with radial wire brushes or cup wire brushes. Bulletin 80.

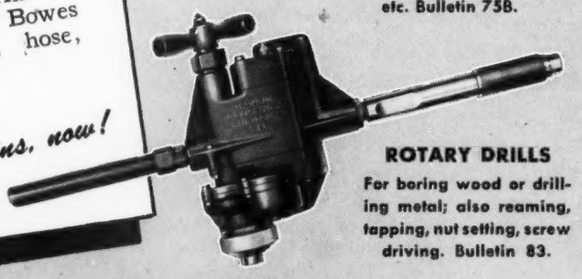
SCALING TOOLS
Handy hammers for cleaning paint, weld splash, scale from metal surfaces, etc. Bulletin 75B.



RAMMERS
For back fill tamping of earth excavations, and for ramming in the foundry. Bulletin 76B.

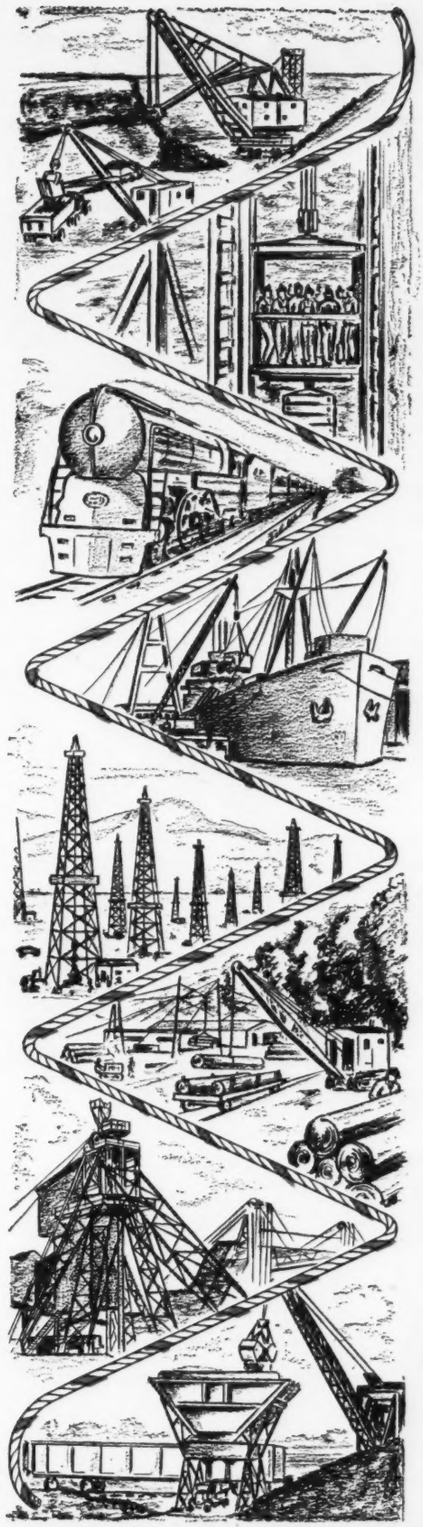
Whether your needs are immediate, or for production scheduled for later delivery, you should know about these useful Cleco tools. The complete Cleco line offers the *right* tool for many major operations. Fast workers, that take it easy on air consumption, Cleco Tools are the product of over 50 years experience in this field . . . All the accessories, too — Bowes Couplings, valves, hose, etc.

Write for Bulletins, now!



ROTARY DRILLS
For boring wood or drilling metal; also reaming, tapping, nut setting, screw driving. Bulletin 83.

THE CLEVELAND PNEUMATIC TOOL CO.
3781 EAST 77TH STREET • CLEVELAND 5, OHIO
Branch Offices in All Principal Cities



Wherever WIRE ROPE *is used on Tough Jobs . . .* THERE *Is the Proving Ground for*

"HERCULES"

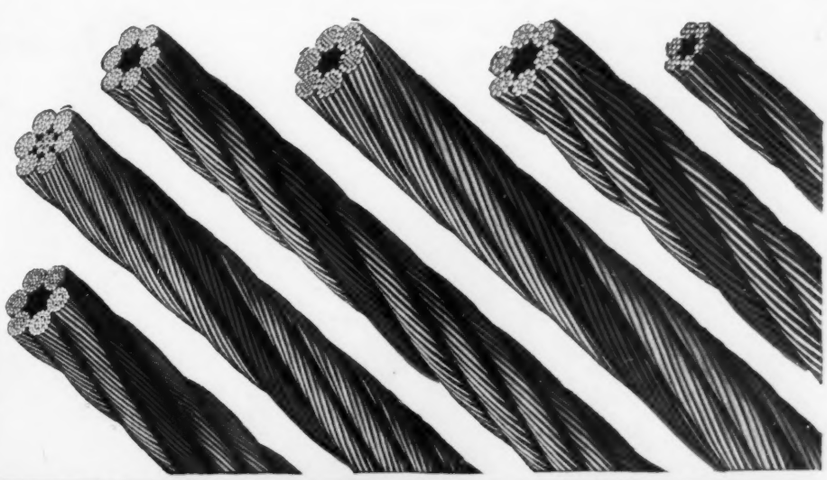
(Red-Strand)

Since the first length of "HERCULES" (Red Strand) Wire Rope was produced, it has continued to increase its many uses in one industry after the other, until today, no matter what 'tough job' is in the offing, you'll invariably find "HERCULES" there . . . proving its strength, toughness, elasticity, durability and adaptability.

Wire Rope comes into more general use every day, and when the job calls for *heavy duty performance,* you'll make no mistake in specifying "HERCULES" (Red Strand).

There is a type and construction to fit every wire rope requirement, whether Round Strand or Flattened Strand —Preformed or Non-preformed.

Our Engineering Department will gladly submit detailed recommendations for *any* Wire Rope job! Just ask us.



MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS — ESTABLISHED 1857

5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK . . . 90 West Street
CHICAGO . . 810 W. Washington Blvd.
DENVER . . . 1554 Wazee Street

SAN FRANCISCO . . 520 Fourth Street
PORTLAND . . 914 N. W. 14th Avenue
SEATTLE . . 3410 First Avenue South

...a peek into the future—

two brand new asphalt plants

for the bigger jobs—

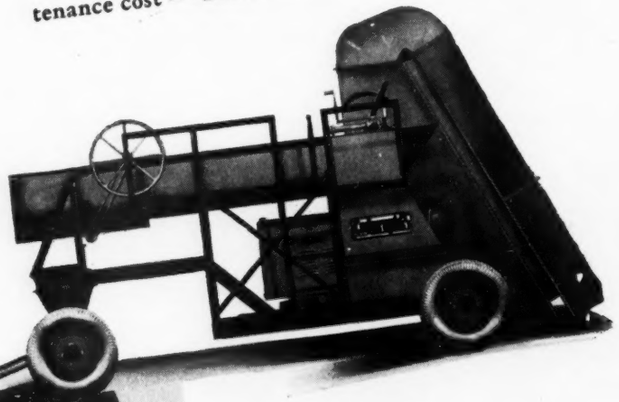
THE MODEL "F"
(batch type)

Here's the most portable, 2,000 lb. batch type plant you ever saw. It grades the aggregate, weighs the material, mixes it to suit specifications, does it better and satisfies the most rigid inspection. You can set it up ready for operation *faster* than any other plant we have ever built. Folding elevator is the only part that has to be raised. Patented skip elevates the aggregate from batcher near ground level to Pug Mill thus eliminating all tower structure. Mix is discharged directly into trucks without using belt conveyors. The Model F is the plant you have been waiting for to give you portability, low cost and troubleproof operation. Uses our standard sizes of dryers. Handles 2,500 pounds easily.

for the smaller jobs—

THE PATCHMASTER
(continuous-mix type)

Its name describes it perfectly — the ideal machine for making patch material for anybody's paved roads or streets — anywhere. The Patchmaster is a continuous-mix type plant that will turn out a remarkably accurate mix at the rate of 25 to 30 tons per hour. Available with or without running gear, or drier, this new plant can be used as a portable or stationary plant to meet practically any plant mix problem. Gasoline or diesel engine or electric motor for power. Low priced — Low maintenance cost — Better mixes.



THE IOWA LINE
of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS—STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS—TRAPS
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

Cedarapids

Built by IOWA

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa

We build all 4 Material Handling Buckets

PMCO

ALL PURPOSE

- SHOVEL
- PULLSHOVEL
- DRAGLINE
- CLAMSHELL

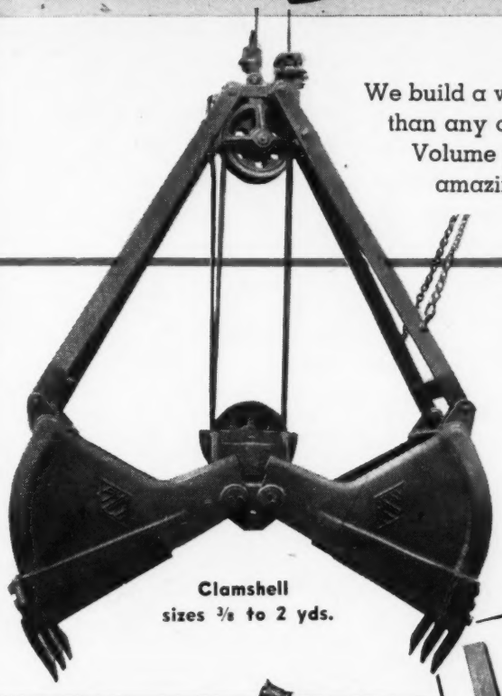
See your shovel engineer or equipment dealer about PMCO dippers and buckets.

AMERICA'S MOST COMPLETE LINE OF MATERIAL HANDLING BUCKETS

We build a wider and more complete line of material handling buckets than any other manufacturer.

Volume production methods enable us to build a better bucket with amazing economies in manufacturing.

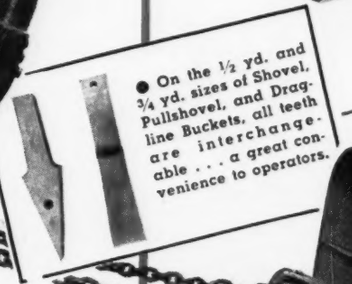
. . . Experience Counts . . .



Clamshell
sizes 3/8 to 2 yds.

Pullshovel
sizes 3/8 and 3/4 yd.

● On the 1/2 yd. and 3/4 yd. sizes of Shovel, Pullshovel, and Dragline Buckets, all teeth are interchangeable . . . a great convenience to operators.



Shovel
sizes 3/8 to 18 yds.

Dragline
sizes 3/8, 1/2, 3/4, 1 1 1/2, 2, 2 1/2 yds.

WE OPERATE THE LARGEST AND MOST COMPLETE MANGANESE STEEL FOUNDRY IN THE UNITED STATES

Quality Since 1880

PETTIBONE MULLIKEN CORPORATION

4700 West Division Street, Chicago 51, Illinois

"Mileage means money to us!"

M. L. ADLEY, Treas.
Adley Express Co.
New Haven, Conn.

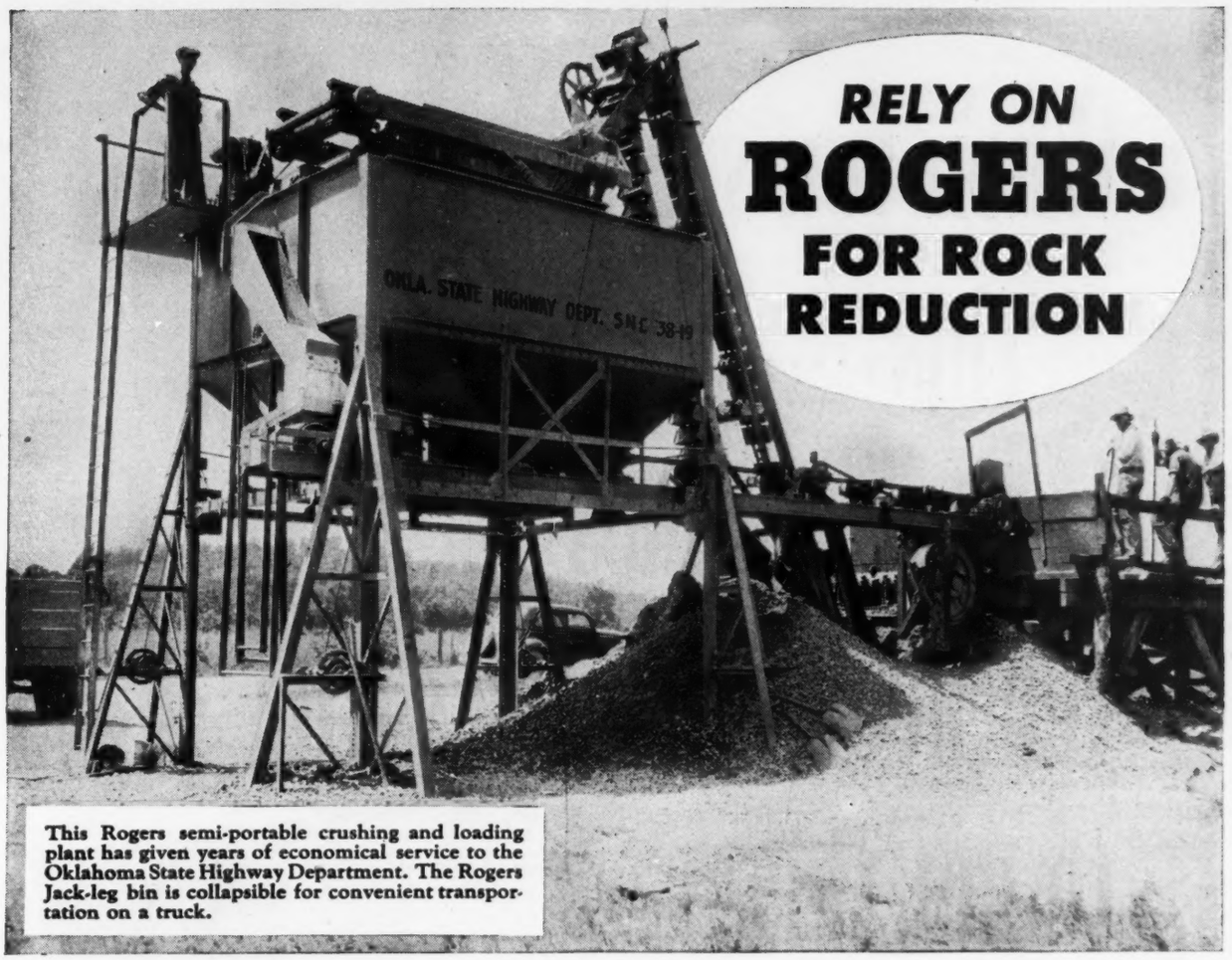
● "Our East Coast operation of 400 highway carriers traveling over 500,000 miles per month and hauling some 12 million pounds per week, requires careful estimating and cost accounting. For the past 25 years our records proved Armstrong Tires are economical and dependable. I am now looking forward to an even better Armstrong Tire to aid us in reducing operating costs . . . mileage means money to us."

SINCE 1912 hundreds of commercial car operators have learned that *you can't buy a better tire than an Armstrong!* For years, we have pioneered in making tires that wear longer and cost less. You can count on an Armstrong to give you a tire that will perform better, last longer, stand up under all conditions and cost you less per mile of use! That's not a statement—it's a promise, a promise backed by the thirty-year integrity of the manufacturer.

For literature or information write your Armstrong distributor or to Armstrong Rubber Company.

ARMSTRONG TIRES

Manufacturers of Quality Tires and Tubes Since 1912 · General Offices and Plant—460 Elm Street, West Haven 16, Conn.

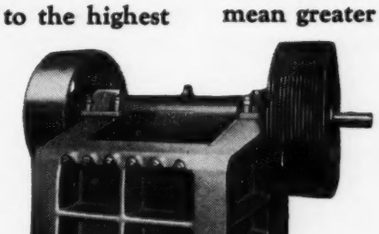


RELY ON ROGERS FOR ROCK REDUCTION

This Rogers semi-portable crushing and loading plant has given years of economical service to the Oklahoma State Highway Department. The Rogers Jack-leg bin is collapsible for convenient transportation on a truck.

EQUIPMENT FOR CRUSHING...SIZING...CONVEYING...STORING

Rogers offers a complete line of rock reduction equipment – every piece built to the highest standards of performance, strength and reliability. When you "Rely on Rogers" for your equipment, you can be certain that no part of your operations will be handicapped by the failure of one link in the process. The extra strength and extra capacity built into every Rogers crusher mean greater production at a lower operating and maintenance cost.



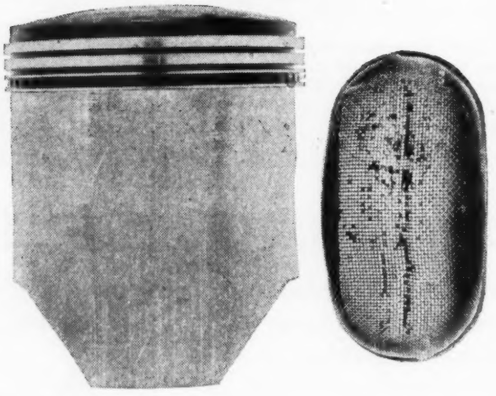
Rogers jaw crushers available in 16 sizes are so sturdily built that, despite greater capacity, there has never been a shaft or bearing failure reported in a Rogers.

ROGERS IRON WORKS CO.

JOPLIN, MISSOURI

Quarry Plants • Gravel Plants • Jaw Crushers • Roll Crushers • Belt Conveyors • Bucket Elevators • Screens • Feeders • Steel Bins

When you see this..... ⇨ in your engines you need Stanolube HD to get this.. ⇨



WHEN YOU SEE that dark reddish-brown coating on gasoline engine pistons, and when you can't see through oil screens, you have two signs that you need Stanolube H D. Yes, and there are two reasons why Stanolube H D will answer your need.

REASON NO. 1: the oxidation inhibitor in Stanolube H D was developed by Standard Oil to minimize oil oxidation and to eliminate troublesome varnish formation on pistons.

REASON NO. 2: the detergency additive in the oil prevents the settling out of deposits in crankcases, oil lines, and screens.

Cleaner engine operation means: (1) more power because of free rings; (2) fewer overhauls to replace worn and damaged parts and to remove engine deposits; (3) less danger of road failures from clogged oil lines.

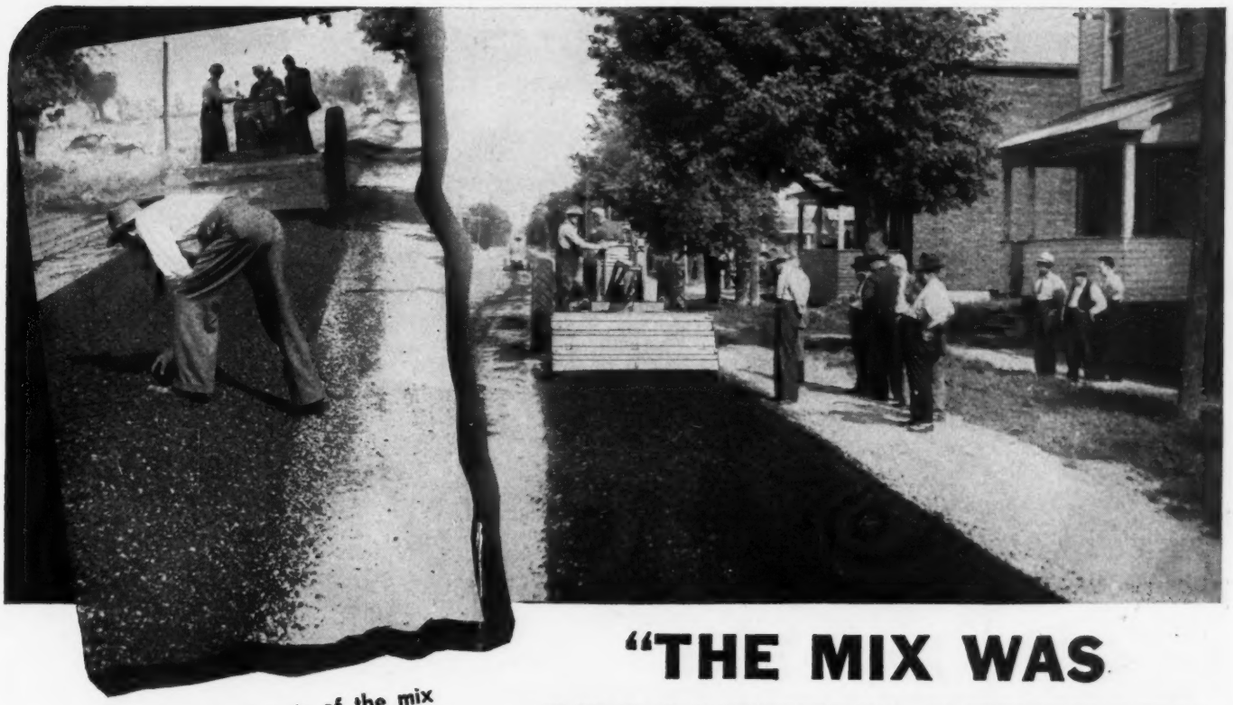
The remarkable additives in Stanolube H D will also help you control "cold engine sludge" if your equipment operates in intermittent service this winter.

A Standard Automotive Engineer can tell you how these heavy duty additives in Stanolube H D will save maintenance time and money for you. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

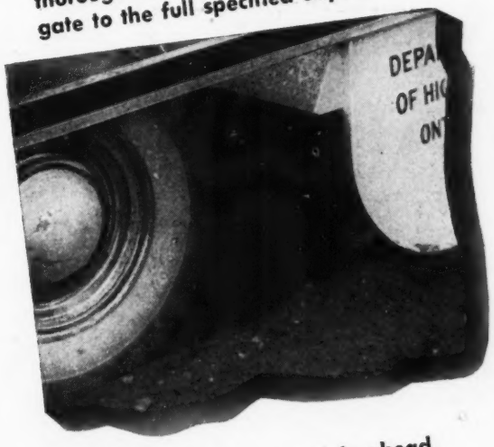
Buy and hold more Victory Bonds

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

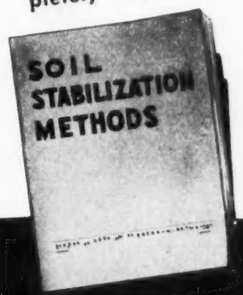
★ FLEET CONSERVATION SERVICE



Careful and repeated tests of the mix disclosed perfect uniformity in the thorough distribution of oil and aggregate to the full specified depth.



Heavy "spill-over" of materials ahead of the mixing rotor, obtained by the SEAMAN, means an automatic "re-mix" in each pass; — an important factor in obtaining a large daily output of completely mixed materials.



Convenient, — practical, "Soil Stabilization Methods" compiled by Seaman Engineers is yours on request. Ask for Bulletin C-24.

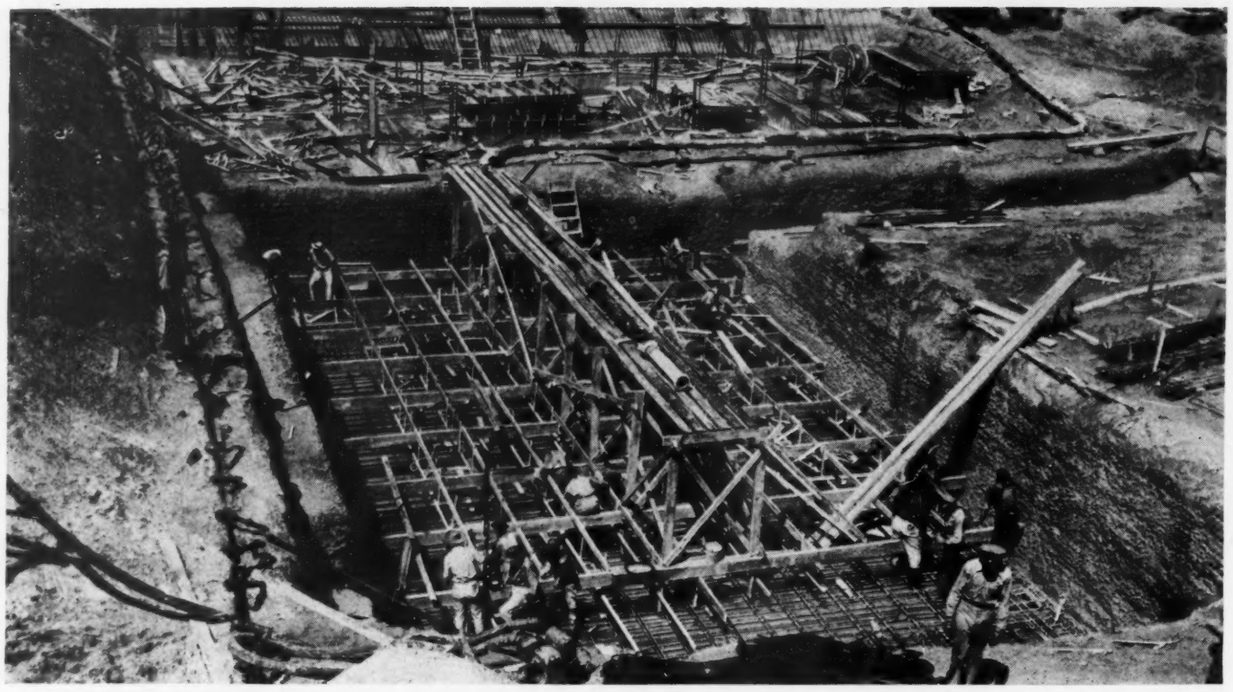
"THE MIX WAS *ABSOLUTELY PERFECT*"

A letter from Mr. G. Barclay Nicol, Managing Director, General Supply Company of Canada describes a job of bituminous mat construction near Ottawa, Canada. Road mixing was handled by the SEAMAN MIXER. Two methods were employed. Some sections were mixed in the windrow; other sections by operating the SEAMAN on the aggregate spread flat. This latter procedure is especially recommended in the treatment of large areas or in level going. Mr. Nicol writes: *"I was down on Friday to see the completed road and found that the mix was absolutely perfect. They saved a large amount of oil by mixing in this manner against mixing with the motor carriers and probably on the four miles will save enough money in the oil almost to purchase the machine".* A mile a day of 2 to 3 inch mat comprised of a mix of oil and ¾" screen aggregate, — 16 feet in width was completed, with the SEAMAN handling the road mixing operations.

C-113

ALLIED EQUIPMENT AEM MEMBER INDUSTRY

SEAMAN MOTORS
MILWAUKEE 3, WISCONSIN



POWER PLANT FOUNDATION
Hattiesburg, Mississippi
Contractor: E. O. KORSMO CONST. CO.
Memphis, Tennessee

MISSISSIPPI
may be a "DRY" STATE, but...

WHEN you're digging a deep foundation for a power plant in clay, fine sand, and gravel, next door to a river—you're apt to find it decidedly wet!

In spite of difficult soil conditions, MORETRENCH WELLPOINTS kept this job dry for several months—eliminated expensive sheeting, enabled the contractor to work under dry conditions.

In buying or renting wellpoints, like everything else, you get what you pay for. That's why the experienced contractor orders Moretrench time and again. He counts on getting results. He knows he'll save money.

When you're bidding a wet job, contact us for an estimate on your pumping costs. We welcome inquiries—large or small.

MORETRENCH CORPORATION

90 WEST STREET, NEW YORK 6

ROCKAWAY, NEW JERSEY

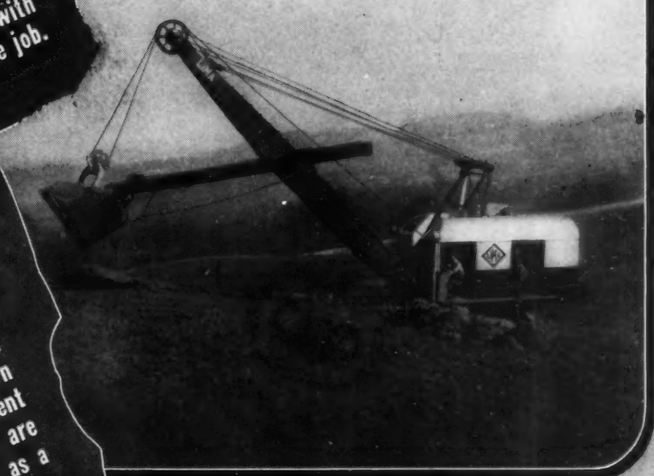
CHICAGO NEW ORLEANS TAMPA

LIMA TYPE 1201 (3 and 3½ ★ Yd. CAPACITY) SETS THE TREND FOR GREATER OUTPUT

The smooth, effortless control of the LIMA Type 1201 is made possible through air-operated clutches. This all-important feature assures greater output thru less operator fatigue. A further advantage effective thru air-control is, simplified clutch adjustment. Only one adjustment necessary and when made, will retain the adjustment for several months. A LIMA Type 1201 with air-control means more productive time on the job.

The LIMA Type 1201 can hoist, swing, travel or boom up or down at the same time. This advantage enables the user to do a wider variety of work without the loss of time due to changing from one motion to another. This is an advantage you will appreciate when working in close quarters or where frequent moves are necessary. Independent clutches are especially desirable when working machine as a crane.

The greatest destroyer of machinery is friction. This profit taking hazard is overcome in the LIMA Type 1201 by the use of anti-friction bearings at every vital bearing point. LIMA does not stop at putting these wear resisting bearings only where high speed shafts revolve, but in the clutches, drums, cone rollers and other points where friction is commonly found. It costs less in the long run to operate a LIMA.



Regardless of how carefully a job is figured, how skillfully it is laid out, profitable results depend on the selection of the right type of equipment and its advantages to make big output possible. The LIMA Type 1201 shown in the illustration is a 3 or 3½ yard shovel (depending on length of boom and handle) or a 65 ton crane. It is in high favor with quarry operators, open-pit miners and contractors who demand top-notch performance from the equipment they buy. Look to LIMA for the shovel, crane or dragline of the right capacity for the job you are planning.

LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division - - - LIMA, OHIO, U. S. A.

NEW YORK, N. Y. PHILADELPHIA, PA. NEWARK, N. J. MEMPHIS, TENN. ST. LOUIS, MO.
DALLAS, TEXAS PORTLAND, ORE. MINNEAPOLIS, MINN.
SAN FRANCISCO, CALIF. SEATTLE, WASH. LOS ANGELES, CALIF. SPOKANE, WASH.
MONTREAL, Quebec, Can. VANCOUVER, B. C.

★ QUARRY WORK

LIMA Cranes Shovels Draglines

Capacities CRANES 13 TONS TO 100 TONS
SHOVELS ¾ YD. TO 5 YDS. DRAGLINES, VARIABLE

MOVE MORE YARDS faster-at lower cost!

YARDAGES moved by power units at 3 miles an hour was *once* considered fast, low-cost hauling.

But today that speed is *high*-cost operation. Today those slow-moving units are obsolete—made so by modern equipment that rolls on rubber—on BIG pneumatic tires. For *BIG* tires roll easily over job-site bumps, make faster-hauling power units possible.

That's why earth-moving speeds are many times faster today. That's why today's rubber-tired equipment enables one man to fast-haul up to 15 tons and more at over 10 miles an hour, *and do so at lower costs-per-ton-mile than dirt was ever moved before!*

With gigantic postwar jobs planned the country over, earth-moving schedules will call for bigger and bigger yardages to be moved faster and faster. Your costs—and your contracts—will be determined by the speed with which you haul.

So plan now to get and hold your share of big jobs by putting your equipment on big tires. And when you're ready, choose with care—choose Goodyears. Job-proved tops in performance, Goodyear off-the-road tires come in 3 tread designs to meet all operational needs, deliver lower costs-per-ton-mile, are *first choice* with cost-wise contractors everywhere. It pays to buy—and specify—Goodyears.

Sure-Grip, All-Weather—T.M.'s The Goodyear Tire & Rubber Company

Caterpillar Diesel DW-10 tractor with Goodyear Sure-Grip tires pulling LaPlante-Choate Carrimor scraper on Goodyear All-Weather Earth Mover tires, moving heavy clay on airport job.

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Construction Methods

ROBERT K. TOMLIN, Editor

Volume 27 — DECEMBER, 1945 — Number 12

Extension Boom

Hoists Concrete for

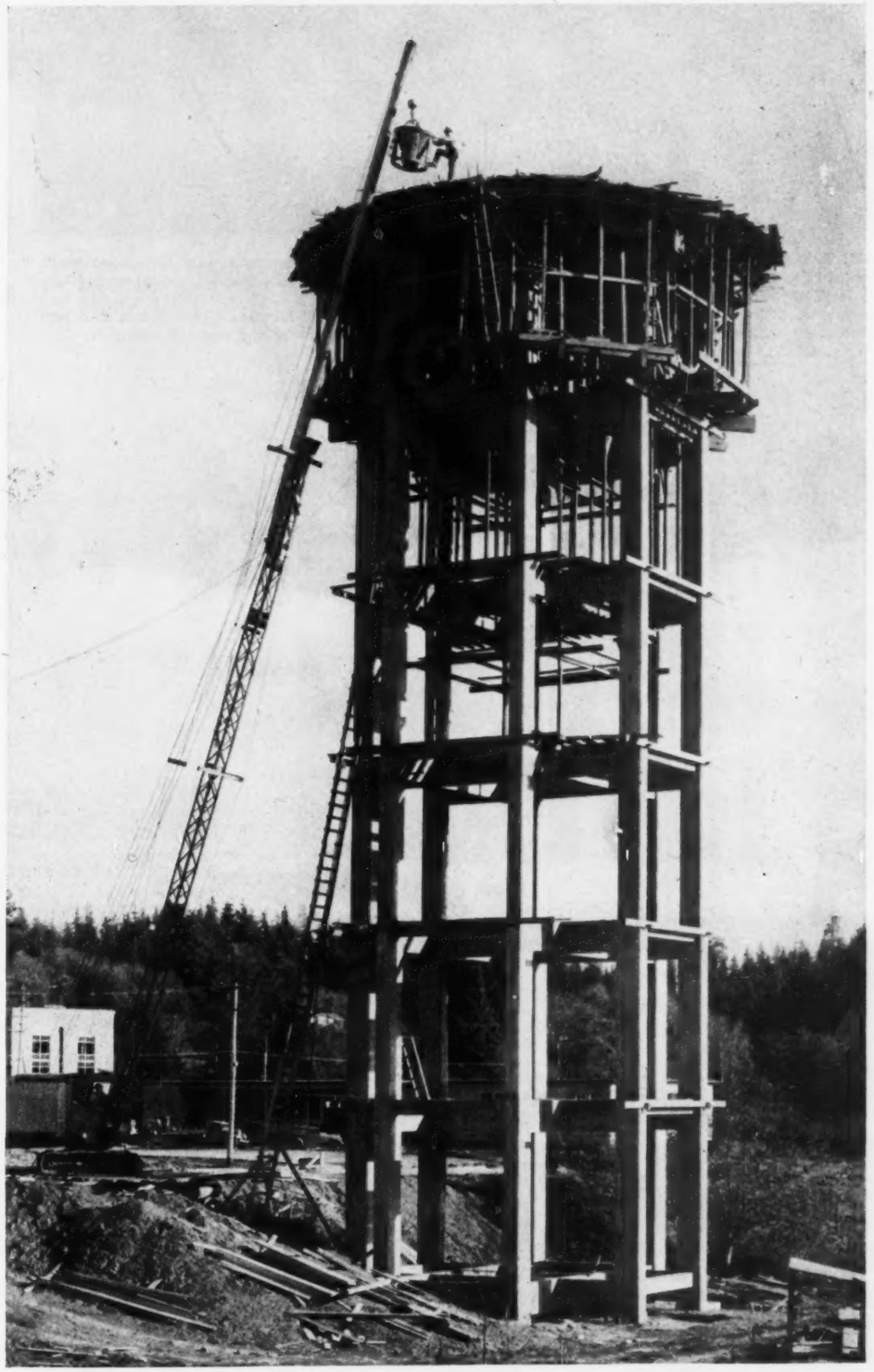
112-FT. TOWER

TWO ELEVATED WATER TANKS, each of 200,000-gal. capacity, for the Astoria, Ore., Naval Hospital, rest on unusually high concrete towers, completed with the help of a long boom extension on a crawler crane. The taller tower is 112 ft. from footings to tank platform, or 132 ft. from the ground to the water line in the tank. The towers are designed for a 30-lb. wind load with working stresses of 1,200 psi. for the concrete and 20,000 psi. for reinforcing steel.

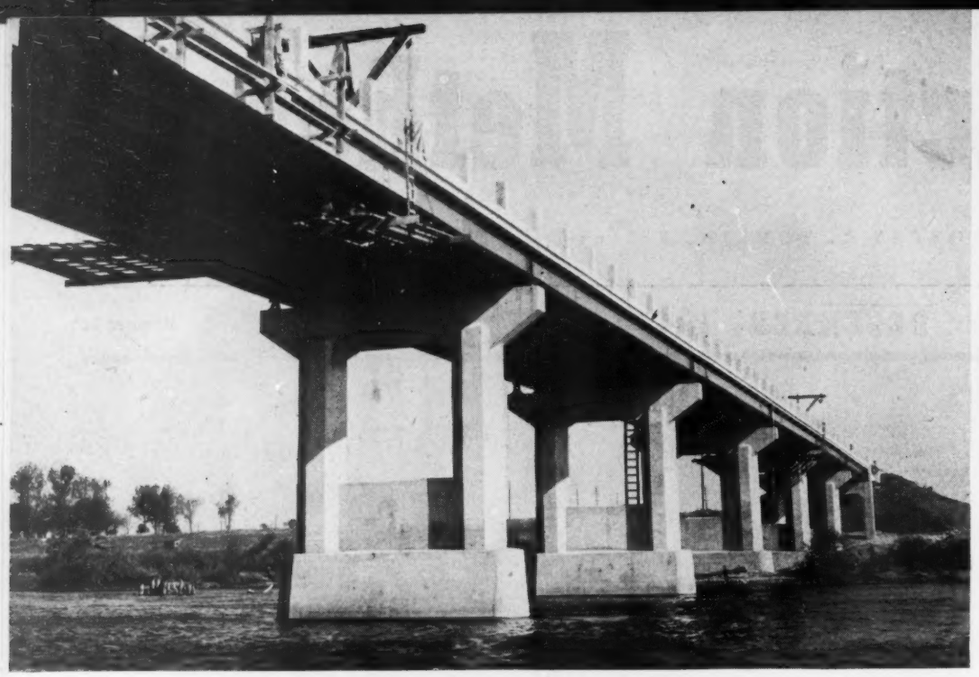
Each tower consists of eight columns with horizontal struts, designed as rigid frames for taking bending moments caused by wind loads. The top slab, which forms the bottom of the tank, is reinforced in two directions and supported on concrete girders surmounting the tower. The tanks proper are 43 ft. in diameter and have walls 20 ft. high of cedar staves 4 in. thick, built in the conventional manner.

For the high lift in delivering concrete to the top of the tower, a 55-ft. timber extension was attached to the boom of a Lorain 40A 1¼-cu. yd. crane which was used throughout the job. This rig served, successively, for excavation, piledriving and raising construction material.

Capt. G. H. Duncan was the public works officer in charge for the Navy. Lieut. Brawton was resident officer, and Art Neukirch was superintendent. Tank walls were supplied by the Horizontal Stave Tank Co., Seattle. Tanks and towers were designed by Harry R. Powell, structural engineer, Seattle.



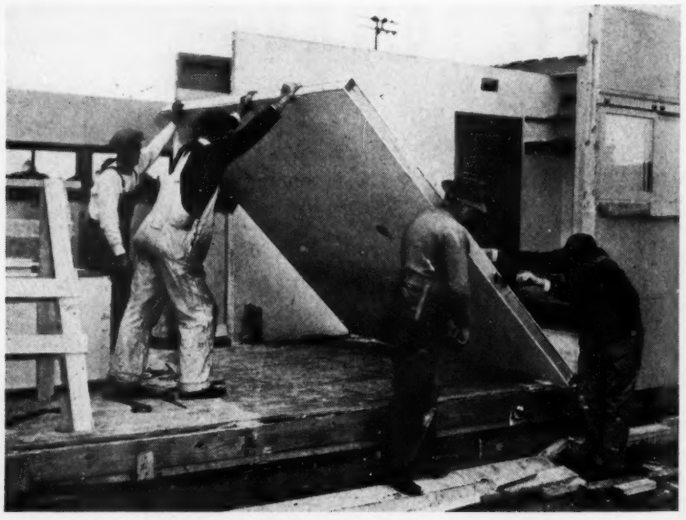
CONCRETE BUCKET on extension boom delivers concrete to tower platform 112 ft. above ground.



MISSISSIPPI RIVER BRIDGE, to carry Minnesota Trunk Highway 100 across stream few miles north of Twin Cities, nears completion under $311,000 contract awarded by Minnesota Department of Highways to A. Guthrie & Co., St. Paul, in October 1944. Structure consists of eight concrete piers and two abutments on timber piles carrying five 100-ft. steel girder spans, two 85-ft. steel girder spans and two 45-ft. concrete deck girder end spans. Concrete deck provides 27-ft. roadway and one 5-ft. sidewalk.

COVERING 6,384 ACRES, Navy's huge supply depot at Guam is largest U. S. advance base built by Seabees to supply Pacific Fleet. Facilities in-

THIS MONTH'S NEWS REEL

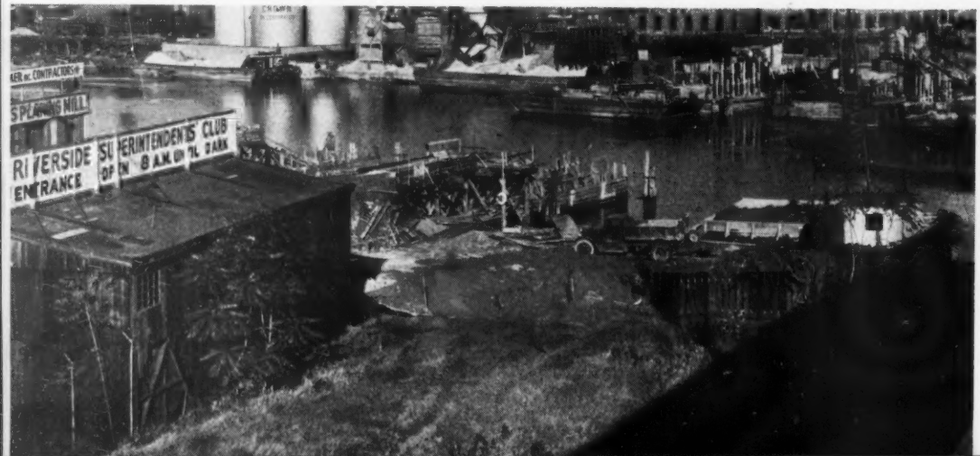


WAR HOUSING RE-USE DEMONSTRATION will be staged near Washington, D. C., Jan. 12-Feb. 9, by Federal Public Housing Authority, to show various types of non-residential structures which can be built from surplus temporary war housing units. Here units at Berkshire Courts project in Bridgeport, Conn., are dismantled by Roth-Schenker Corp., of Washington to ship to exhibit.

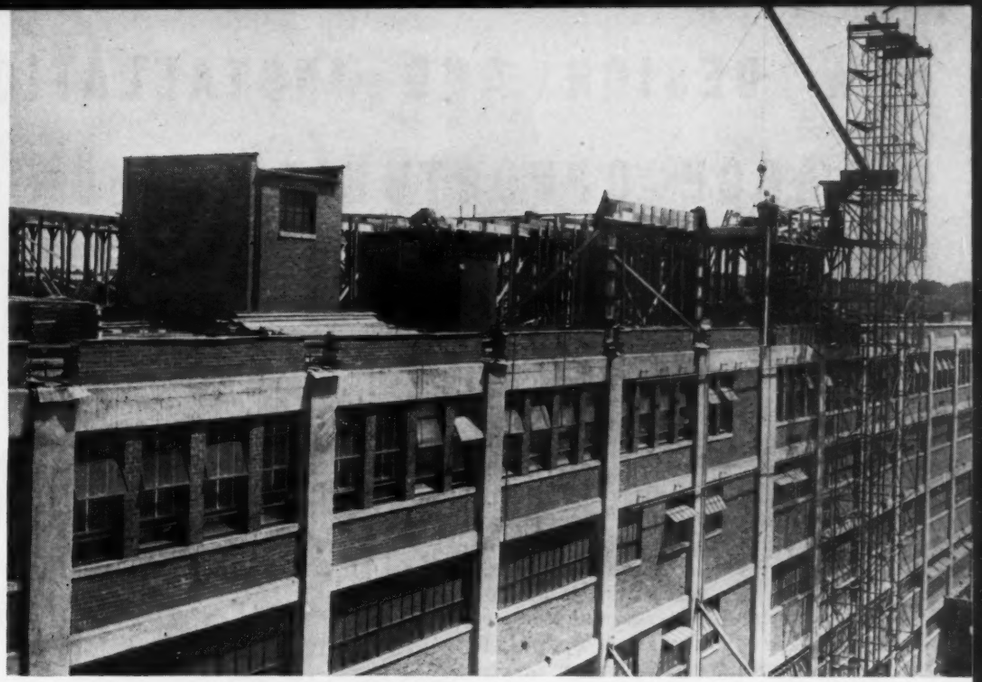
FLOATING AIRSTRIP (below), called "Lily," consists of hundreds of hexagonal cans with canvas surface across top. Cans are so assembled that motion of waves increases tension of surface. Flexibility is controlled by underwater dampers. Inventor R. M. Hamilton, British scientist, claims strip will remain flat in waves up to 36 ft. from crest to crest.

British Official Photo from Acme

OBSERVATION POST (below) for public is provided by Senior & Palmer, Inc., contractors for William A. Stickel Memorial Bridge foundations in Passaic River at Newark, N. J. Visitors to "Riverside Superintendents' Club" are presented with booklet giving details of project, personnel and other information.

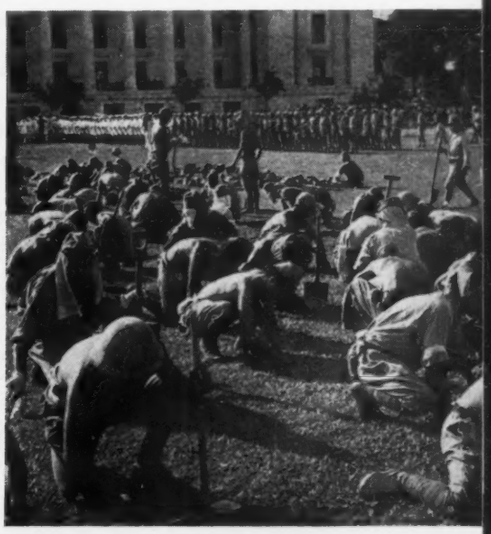


clude 451 Quonset huts, each 40 ft. wide and 100 ft. long, providing 1,804,000 sq. ft. of storage space, as well as other buildings. British Combine Photo



FIFTH FLOOR is added to office wing of main plant of General Tire & Rubber Co. at Akron, Ohio. Project, which will cost about $250,000 and add 18,000 sq. ft. of floor space, is scheduled for completion Jan. 1, 1945. Contractor is Carmichael Construction Co., of Akron.

TWO WEEKS' SCHOOLING in know-how of construction contracting prepares Shell Oil Co. special contractor representatives to serve clients better in territories east of Rockies. Forty-four construction industry speakers address group in New York. During question period after one session, JAMES M. MORRISON (in inset, left), head of contractor sales department and manager of course, discusses construction problems with ALBERT E. WALKER (center), assistant supervising engineer, Travelers Insurance Co., representing Greater New York Safety Council, and FRANK LESLIE-JONES, New York manager, Bucyrus-Erie Co. Group heard 44 experts.



RESTORATION OF SINGAPORE, $44,000,000 naval station in Far East, is begun by British. Here Jap fatigue party clears up green in front of Municipal Buildings. British Combine Photo

U. S. ARMY ENGINEERS IN CZECHOSLOVAKIA conduct training school for operators of heavy equipment (below). Czechoslovakian Ministry of Transport officials and engineers watch operation of Caterpillar diesel tractor and scraper on unfinished road project at Pilsen where Nazi slave labor once worked by hand.

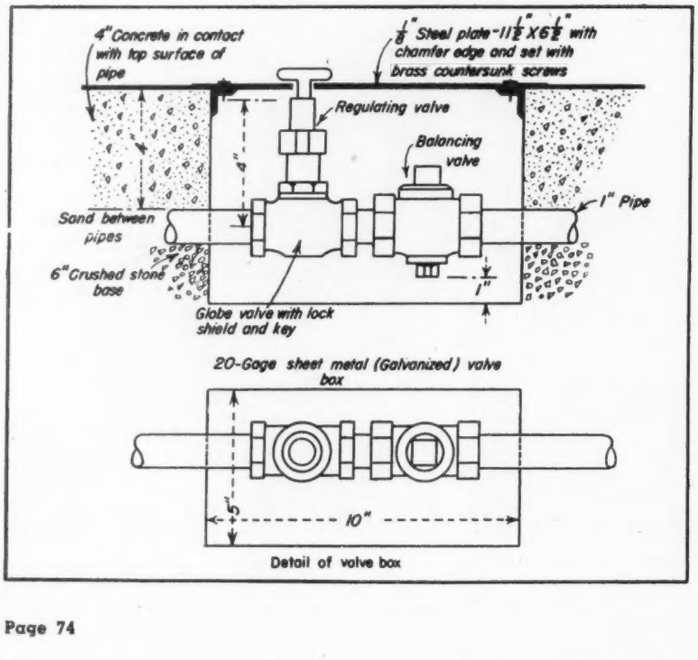
NEW DESIGN AND INSTALLATION TECHNIQUES ENLARGE OPPORTUNITIES FOR RADIANT

EIGHT YEARS OF SWIFTLY EXPANDING USE of radiant heating in nearly 2,000 structures of diversified type in the United States have standardized and simplified many of the design and installation techniques and have eliminated previously existing uncertainties about this unique method of space heating. At the same time, increasing familiarity with fabricating procedures has resulted in substantially lower installation costs. Today, a radiant heating system should cost no more to install than any other good wet-type system, and operating costs should be appreciably lower.

In theory, radiant heating is not new, but only during the last decade has it been used to any great extent in this country. The entire principle is based upon control of normal body heat losses by warming the surfaces of a given area with concealed grids or sinuous coils of pipe through which hot water or steam is circulated, thereby preventing excessive loss of body heat to these cooler areas.

A radiant heating system differs physically from conventional systems only in the fact that a large, low-temperature surface is used instead of a small, high-temperature surface such as a radiator. Boilers, feed lines, circulators, thermostats, and other equipment used in conventional heating systems are also used for radiant heating.

Practical considerations heavily favor floor installation of heating coils. Ceiling installations usually cost 10 to 20 percent more, and they are less efficient. Wall coils have been installed only occasional-

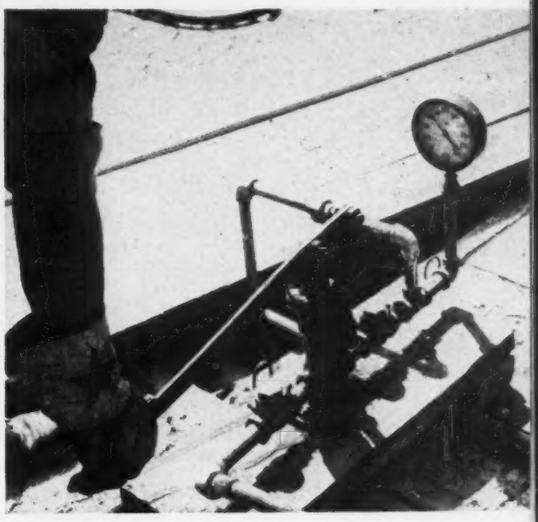

4" Concrete in contact with top surface of pipe
Steel plate 11½" X 6½" with chamfer edge and set with brass countersunk screws
Regulating valve
Balancing valve
1" Pipe
Sand between pipes
6" Crushed stone base
Globe valve with lock shield and key
20-Gage sheet metal (Galvanized) valve box
10"
Detail of valve box

SUNKEN SHEET METAL BOX (left) with ⅛-in. traffic plate in concrete floor is convenient location for control valves of radiant heating system. Once flow of water is adjusted no further regulation is necessary until demands vary.

HOSE SPRAY WETS SAND CUSHION (below) before concrete is placed over floor coils of 1-in. wrought-iron pipe. Radiant heating system in slab insures dry concrete floor for any conventional-type flooring.

VALVE BOX FOR RADIANT HEATING SYSTEM (below) at Thompson Products Co., Detroit, Mich., is cemented in place before 4-in. concrete floor slab is poured over continuous coils of wrought iron pipe laid on thin layer of sand and 6-in. crushed stone fill.

HEATING



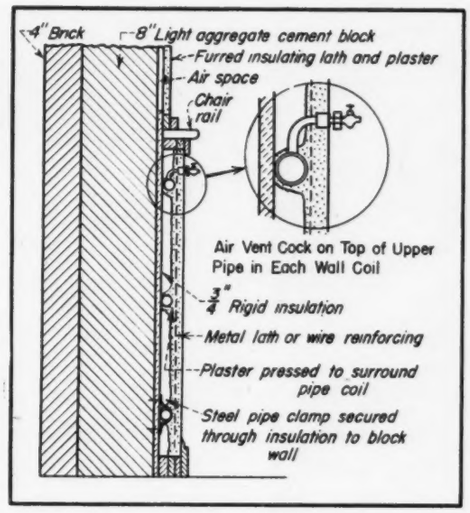
SYSTEM IS TESTED HYDROSTATICALLY for 24 hr. under 100-lb. pressure as safety measure before pouring slab.

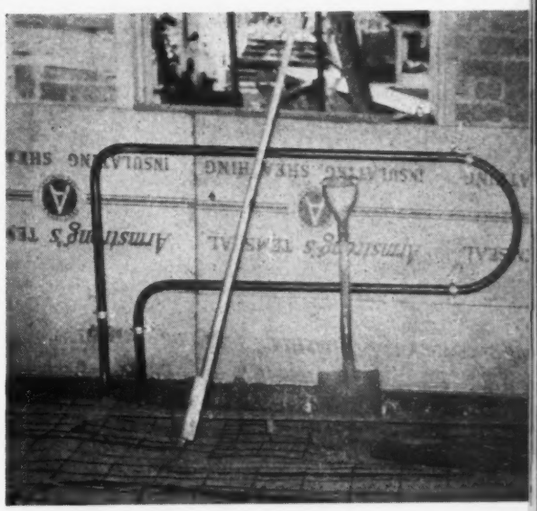
ly to supplement either floor or ceiling units.

Outstanding advantages of radiant heat are that temperature remains uniform throughout the area covered, air currents are negligible, fuel consumption is reduced by lower water temperature requirements, and complete concealment of heating units makes all space usable. Also, radiant heating is cleaner, and provides maximum human comfort at air temperatures appreciably lower than those necessary with convection systems.

Between 1,500 and 2,000 radiant heating installations have been recorded to date in factories, garages, schools, offices, churches, homes and hospitals in this country. Engineering and construction techniques learned from these installations have contributed to the reservoir of information now available. The accompanying notes were supplied from the collection of engineering data on radiant heating in the possession of the A. M. Byers Co., Pittsburgh, which almost single-handedly has pioneered the system in this country.

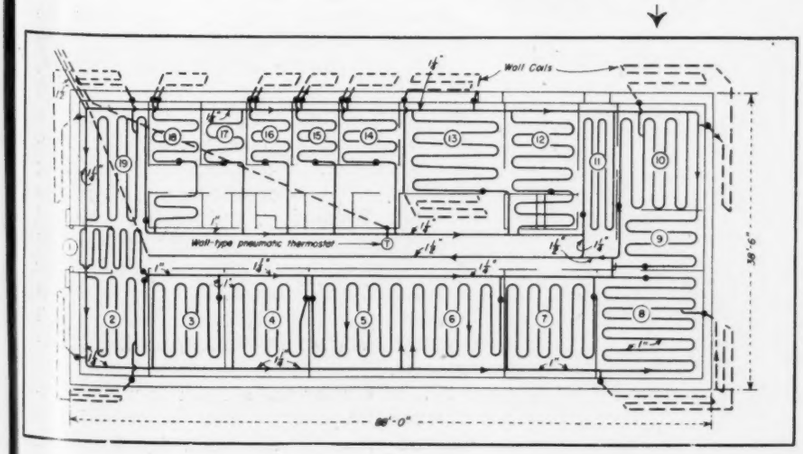
Typical of small radiant heating industrial installations is a recently completed project at the Detroit, Mich., plant of Thompson Products Co., designed by Robert L. Byers of John Paul Jones, Cary

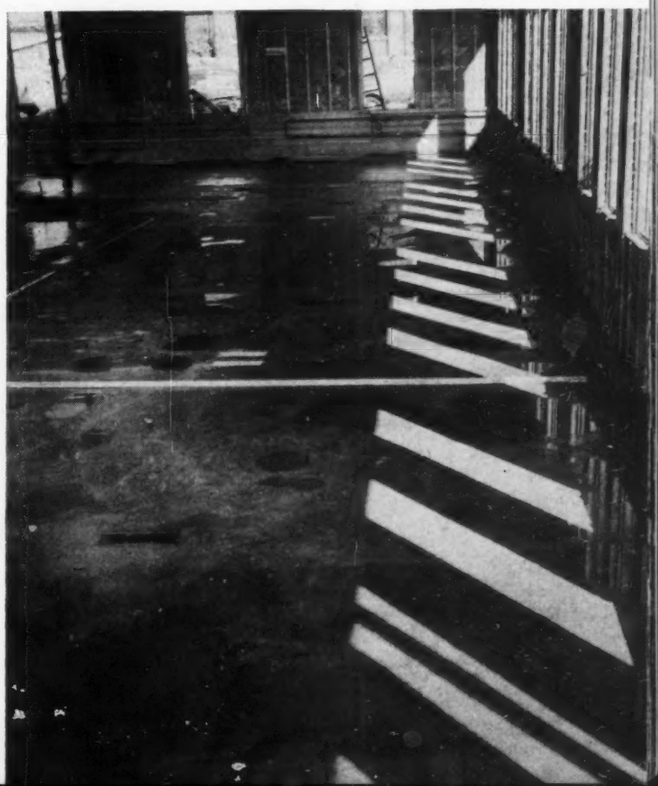

4" Brick
8" Light aggregate cement block
Furred insulating lath and plaster
Air space
Chair rail
Air Vent Cock on Top of Upper Pipe in Each Wall Coil
3/4" Rigid insulation
Metal lath or wire reinforcing
Plaster pressed to surround pipe coil
Steel pipe clamp secured through insulation to block wall

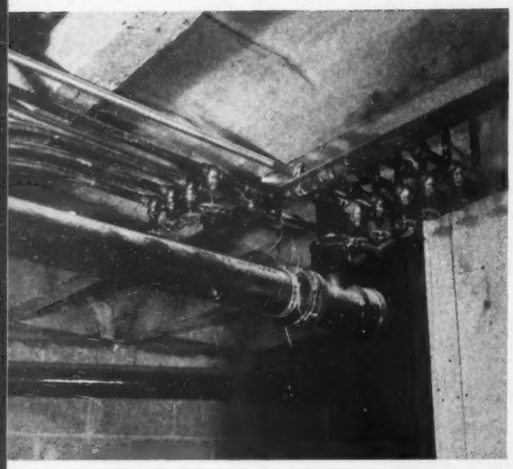


ONE-LOOP WALL COILS supplement floor system in Thompson Products Co. building. Coils are supported by metal clamps which project through ¾-in. insulation into 8-in. light-aggregate concrete block. Section through wall (left) shows how plaster is pressed through expanded metal lath to surround pipe coils.

CONTINUOUS-COIL RADIANT HEATING LAYOUT of Thompson Products Co. personnel building provides unobstructed floor area which permits easy revision of office space. Existing partitions may be moved or new ones added without drastically changing heating system. Numbers on drawing (below) indicate different rooms.







CONTROL VALVES IN BASEMENT of this installation regulate flow of hot water through radiant heating coils to obtain desired temperatures in different zones.

and Millar, engineers, Cleveland, Ohio. Radiant heat using floor coils, supplemented by wall coils in some rooms, was chosen for a one-story, basementless brick building containing ten small offices and a medical department. The general contractor was Barton-Malow Co., Detroit.

In planning this building, heat losses were analyzed room by room, and design temperatures of 70 deg. F. inside and -10 deg. F. outside were selected. Wall construction consists of 4-in. brick, 8-in. light-aggregate concrete block, furred ½-in. insulating lath, and plaster. All windows are single-glazed, double-hung wood sash, with storm windows. The roof consists of 1-in. wood with 4-in. rock wool batts between joists.

Sinuous floor coils of 1-in. wrought iron pipe were laid 18 in. on centers in a cushion of sand over a 6-in. crushed-stone base. Distributing mains of 1½- and 1¼-in. wrought-iron pipe were used. Supplementary wall coils of 1-in. pipe on 12-in. centers are held in place by pipe clamps driven through ¾-in. rigid insulation into concrete blocks. Plaster was pressed to surround the pipe coils, as shown in an accompanying illustration. Upon completion of welding, the system was tested for 24 hr. under a 100-lb. hydrostatic pressure before the concrete floor slab was poured.

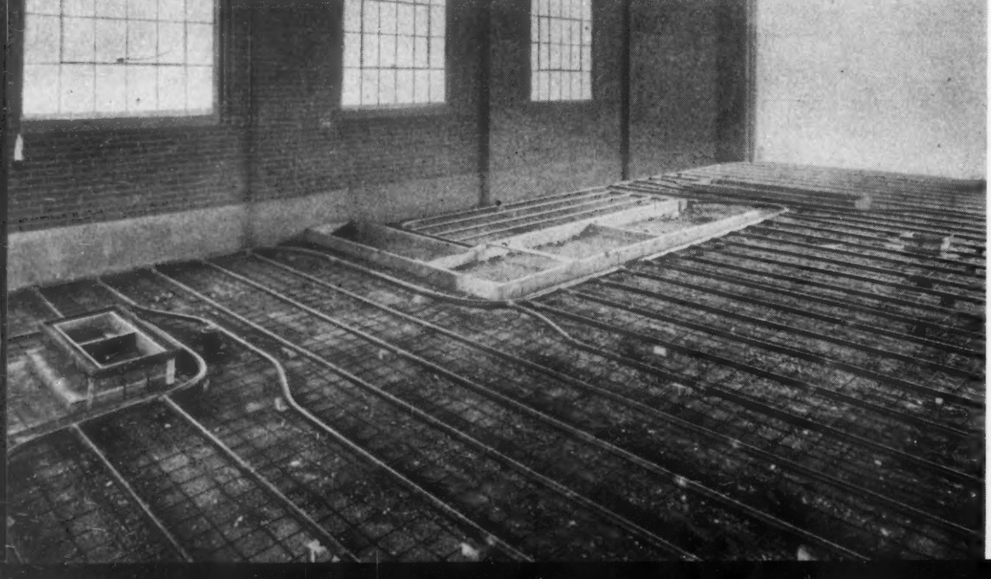
Test Results

In all, approximately 2,200 ft. of 1-in., 107 ft. of 1½-in. and 245 ft. of 1¼-in. pipe were used in the system. The 1-in. floor coils indicated an output of 60 B.t.u. per hr. per ft. or 31 B.t.u. per hr. per sq. ft. of floor with a design water temperature of 120 deg. F., after all loss factors were considered. The supplementary wall coils provided an output of 52 B.t.u. per hr. per sq. ft. of wall.

MAIN SUPPLY LINE for this radiant heating system is laid around exterior walls where heat losses are generally greatest. Header pipe for heating elements is welded to main feeder line.

FIELD WELDING OF WROUGHT-IRON PIPE in radiant heating system is facilitated by use of small jig comprising angle iron and clamps. Bendability and weldability of pipe permit fabrication of coils at site.

BENT TO ACCOMMODATE FLOOR ISLANDS (below) in large service garage, welded pipes are supported on small concrete spacer blocks preparatory to placement of concrete floor.



Bendability of wrought iron pipe, by means of a simple jig, and its weldability permit fabrication of coils at the site. However, on the Thompson Products job most of the coils were fabricated at the shop of the heating contractor, the Bassler-Carter Co., Detroit, Mich. The piping was laid out in a reverse return circuit to minimize balancing, and each room had a hand valve with a loose "T" handle and an individual coil with a plug valve for permanent adjustment. Valves were set in a sheet metal floor box with a flush cover, as shown in accompanying illustrations.

Hot water for the system was converted from the plant's steam boiler and circulated through the coils by a B.&G.

constant circulating pump. The water was heated to 125 deg., and an expected drop of 10 deg. was estimated. On a day when the outdoor temperature was 3 deg. above zero, a test showed water leaving the heater at 122 deg. and returning at 112 deg. Water temperature for the entire building is controlled by a Taylor room modulating thermostat in a corridor.

Conventional-Type Flooring

Terrazzo flooring was installed in the medical department, and other offices were floored with asphalt tile applied with prepared mastic. Since the temperature of the flooring material in a radiant heating system usually does not exceed normal body temperature, any conventional type of floor covering may be used. Heat energy from the pipe coils is transmitted to the concrete flooring and from there is radiated to all other objects in the room, warming them to approximately the same temperature as the floor. Thus no convection currents are formed and too rapid loss of normal body heat is prevented. Successful installations have been made in which the pipes are covered by as much as 6 or 7 in. of concrete.

Radiant heating coils in wood flooring produce the same comfort conditions and have the same operating characteristics as installations in concrete flooring. One of the most common techniques used is fastening of conventional wood floor with mastic to the concrete in which the pipe coils are embedded. A furred wood floor on concrete with pipe coils running between sleepers is another type of construction commonly used. In other cases pipe is installed between floor joists with insulation beneath the pipe runs to block downward heat flow.

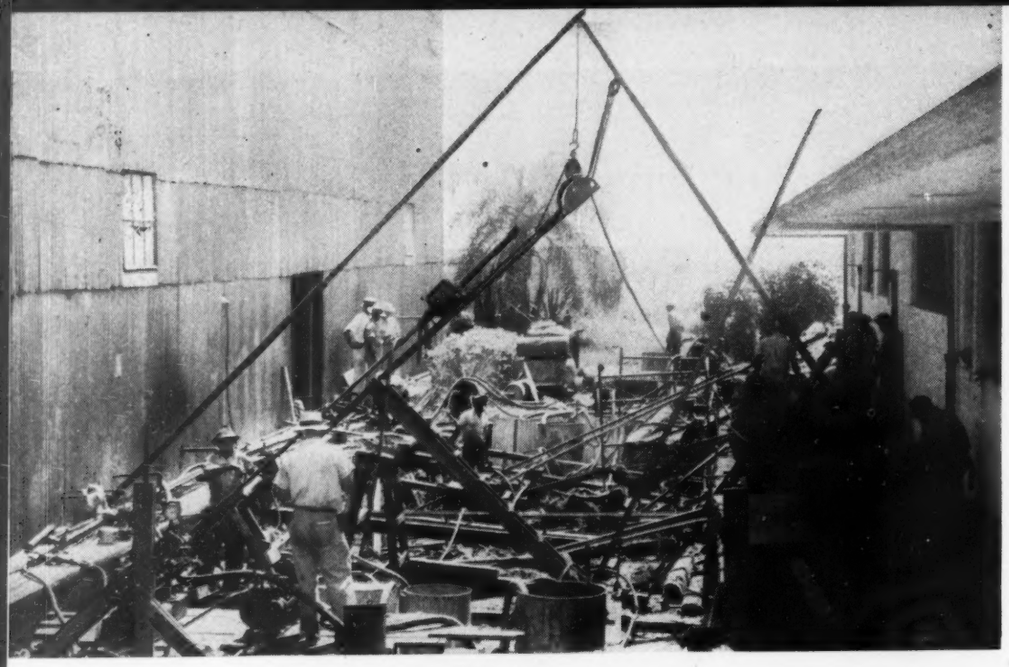
The amount of pipe required for a radiant heating system depends largely upon the rate of heat loss from the space to be heated. A differential between the suitable minimum design temperature and 70 deg. F., generally assumed to be

(Continued on page 170)

FLOOR-TYPE RADIANT HEATING SYSTEM in residence is supplemented by wall coils to provide additional warmth in some rooms. Pipe is laid on rock and earth fill for first floor and on ordinary wood flooring for second story.

RADIANT HEATING COILS (below) in air space between notched wood sleepers on concrete slab, covered with properly seasoned flooring, give satisfactory heating service and permit utilization of entire floor space.

CEILING-TYPE RADIANT HEATING PIPES (below) are anchored to joists and covered with metal lath and plaster. Practical considerations usually favor less costly and more efficient floor installations.

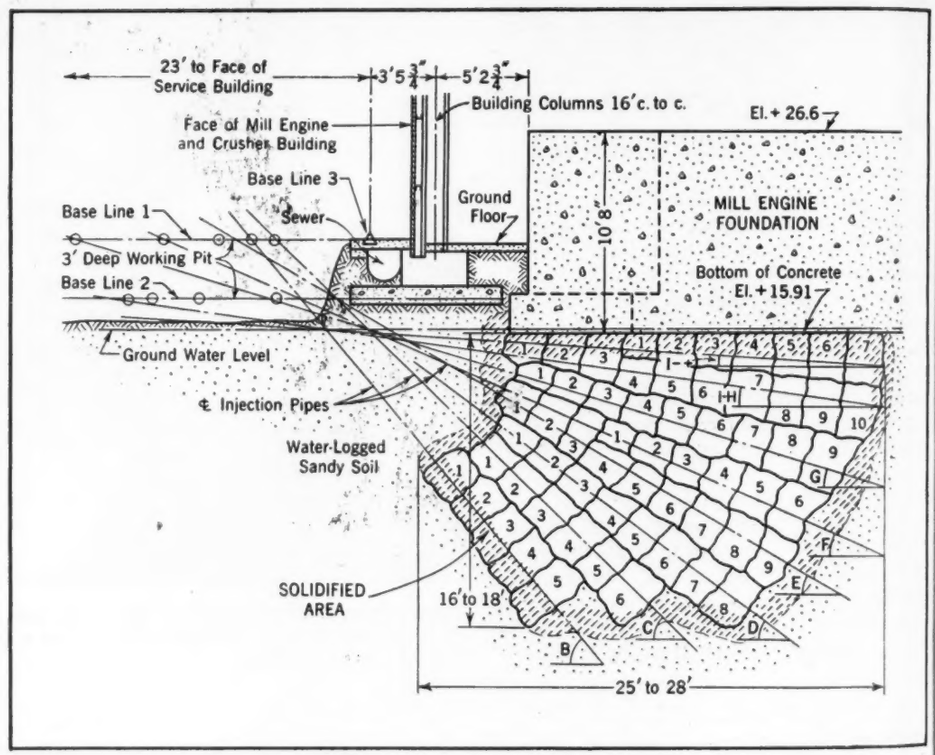


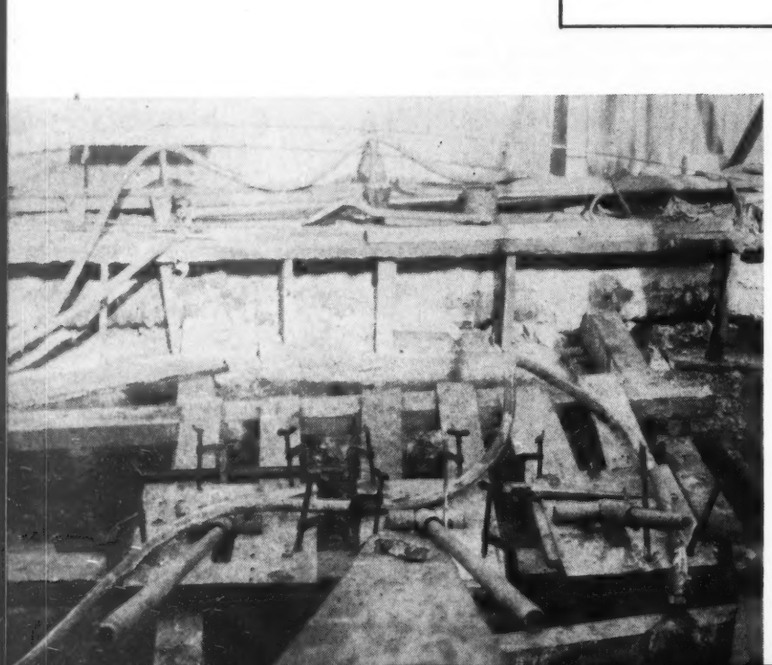
DRIVING INJECTION PIPE under heavy foundation in mill building at left, contractor uses drop hammer outfit, with hammer traveling on inclined plank leads. At lower left is one set of two injection pumps, for chemicals No. 1 and No. 2.

Chemical Injections

Solidify Soil To Stop FOUNDATION SETTLEMENT

BY INJECTING CHEMICAL SOLUTIONS in accordance with a tested formula through driven pipes similar to well-points into wet, medium fine sand under the heavy foundation of a mill-engine and crusher at the Clewiston, Fla., sugar mill of the U. S. Sugar Corp., the Chemical Soil Solidification Co., Chicago, solidified about 660 cu. yd. of the sand and stopped dangerous progressive settlement of the foundation. Pipes of well-point type were driven into the ground under the foundation from outside the building in groups of seven to nine, forming fan-like patterns in vertical planes, as indicated by an accompanying drawing. One chemical was injected through each pipe into the soil as the pipe was progressively driven deeper; a second chemical, which reacted with the first to form a gel, was injected as the pipe was withdrawn in stages, as indicated by the numbered areas on the drawing. The gel rapidly hardened into



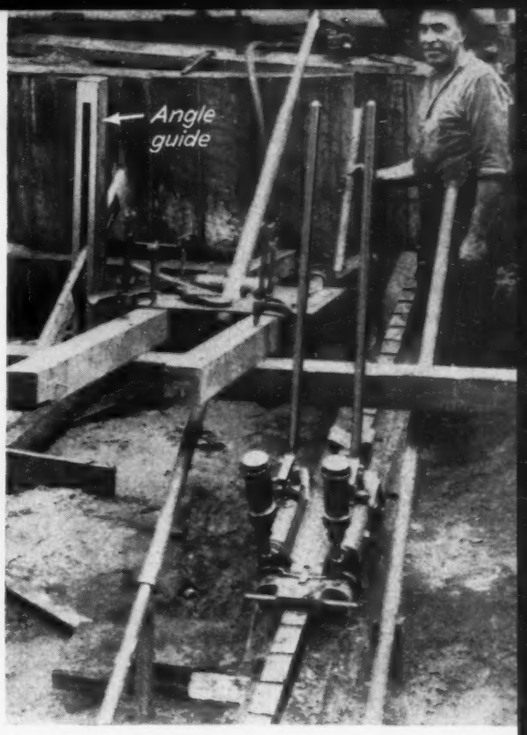


TO STOP SETTLEMENT of heavy mill-engine and crusher foundation resting on water-logged, medium fine sand, pipes resembling well-points are driven from working trench outside building into area below concrete mat, and chemicals are injected under pressure through these pipes to form gel which hardens rapidly to transform soil into hard insoluble mass. Numbered sections indicate injection areas impregnated in succession by chemicals as pipes are driven and withdrawn. Chemical No. 1, injected while pipe is being driven, reacts quickly with chemical No. 2, injected during withdrawal.

←

BATTERY OF THREE INJECTION PIPES (left) is ready for injection. Heavy hose lying across pipes is for connection from chemical pump to driving head on injection pipe. On concrete slab alongside building in background are two pipes for chemical No. 1 and chemical No. 2.

FOR DRIVING INJECTION PIPES at angles of less than 45 deg., air hammer is practical tool.



ALTERNATE METHOD OF DRIVING PIPE is by means of Greenlee pipe pusher, hydraulic device operated by hand. Note pipe sleeve half, part of special pipe guide, held by Pipe Foreman JOHN MARTELL, who has been on every Joosten job since beginning of this kind of work in United States in 1939. Angle guide is employed to check injection angles.

a permanent binder. Operations were completed in 43 working days at a unit cost for solidified soil of about $23 per cu. yd.

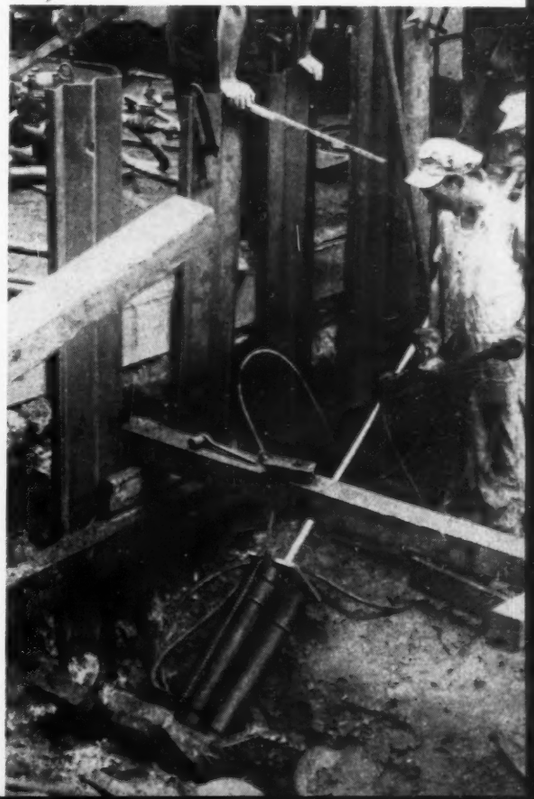
Method of Solidifying Soil—Soil solidification at the Clewiston mill was accomplished by the Joosten process, named after its inventor, Dr. Hugo Joosten, noted Dutch mining engineer, and was facilitated by certain practical improvements recently made by C. M. Riedel and Lawrence Scully, of the Chemical Soil Solidification Co. Generally, the process serves two purposes: (1) Consolidating, or solidifying, loose, sandy soil to increase bearing capacity or to provide impervious curtains underground without excavation. Clay, mud and silt are unsuitable for this treatment. (2) Stopping heavy leakage of water through fissured natural rock or through cracked concrete and masonry structures by high-pressure injections of the Joosten chemicals into pre-drilled holes. This treatment acts quickly and is permanently effective.

In soil solidification, two true chemical solutions are injected under pressure, one after the other, into natural, undisturbed earth through pipes, resembling well-points, which are driven gradually into the soil. Chemical No. 1 is principally a silicate of soda (water glass) solution, which has a rapid gel-forming reaction when it comes in contact with the second chemical, a strong solution of calcium chloride. The gel gradually hardens and binds the sand grains together in a solid, permanent mass which is insoluble in fresh or salt water and is not unlike sandstone. The chemicals penetrate soil almost as freely as water and cannot be bleached out.

Equipment in solidification work is simple, but pressure injection by piston pumps (one for each chemical with pressures up to 400 psi.) must be carried out according to a definite plan to impregnate the ground properly in the desired area and to avoid clogging the pipes. A somewhat different method, known as chem-sealing, is employed for sealing leaky concrete structures or natural fissured rock formations. Chemicals for both soil solidification and chem-sealing are manufactured and furnished by the

(Continued on page 156)

HYDRAULIC TWIN-JACK (below) withdraws injection pipe from impregnated area. Chemical No. 2 is injected into successive zones as pipe is withdrawn by stages.

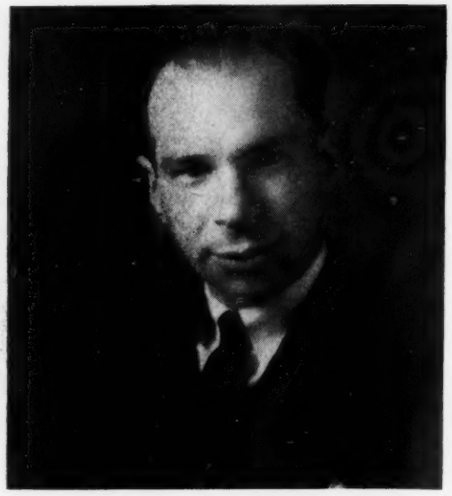


AFTER WITHDRAWAL (below) inspector tests pipe under water pressure to be sure that perforations at point are not clogged. Water jets spraying out of perforations indicate that pipe is clean and that soil zone treated by it has been evenly saturated with chemical.

Special Trunnion Yoke TURNS ODD-SHAPED TANKS

By JACK BEERS

Field Superintendent
Fassler Iron Works, Inc., New York, N. Y.

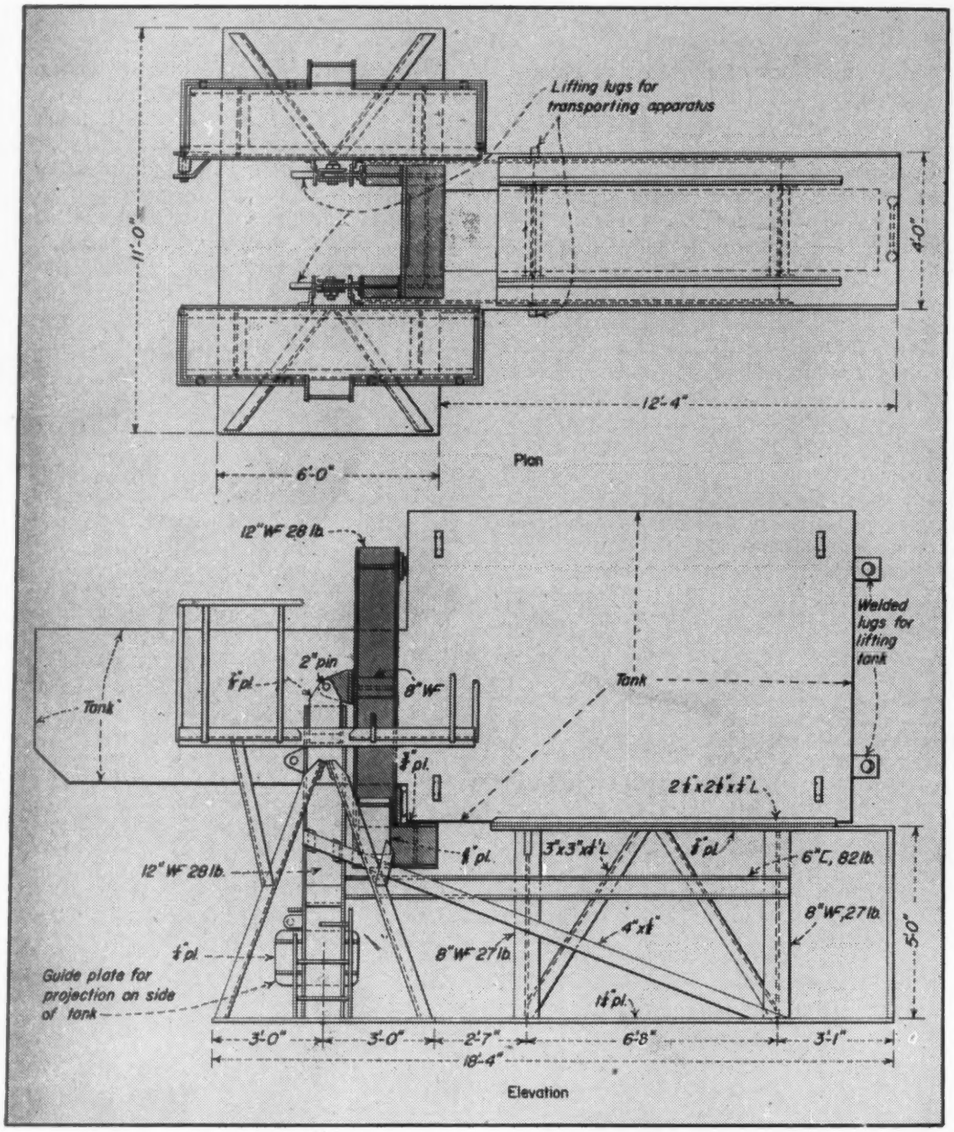


AS GENERAL FOREMAN of rigging and structural steel for Stone & Webster Engineering Corp. at Oak Ridge, Tenn., JACK BEERS devises tank-turning apparatus described in accompanying notes.

SPECIAL TRUNNION-MOUNTED APPARATUS employed in setting several hundred 16-ton tanks of unusual shape at the Clinton Engineer Works of the Manhattan district (the atomic bomb project), near Knoxville, Tenn., on the contract of the Stone & Webster Engineering Corp. for the Corps of Engineers, U. S. Army, saved much time, labor and money. Because of their shape, the tanks were shipped to the project in a horizontal position and had to be turned vertically for placement on concrete piers.

First Method—The first tanks to arrive at the job were set by conventional methods which involved the use of two overhead bridge cranes and special rigging to revolve them into upright positions. This procedure was long and tedious; it required eight men to work 4 to 6 hr. to set one tank, tying up the services of the two overhead cranes during this time and thus slowing down the progress of the job.

Trunnion Apparatus—Delays caused by the original method were obviated by specially built trunnion apparatus, designed and constructed by the author. This mechanism reduced the work of turning and setting a tank to two men with an average time of 15 to 20 min., and it also dispensed with one overhead bridge crane. Expressed in money value, it is estimated that the trunnion-mounted turning yoke saved at least $100,000 in comparison with the original method. This figure does not include time saved by different crafts through release of the second crane.



TRUNNION-MOUNTED YOKE on all-welded steel frame turns 16-ton steel tanks of unusual shape from horizontal to vertical position with aid of overhead crane which lifts end of tank, at right, by means of equalizing sheaves and slings, permitting tank to rotate on yoke about 2-in. pin. Tank has uniform, narrow width of about 2 ft. 4 in. Precautionary cable used for tying tank to yoke during turning operation is not shown. Steel base plate 1¼ in. thick under steel frame increases stability of apparatus.

Handling Tanks

Design of the tank-turning unit can best be understood from the accompanying drawing. It is an all-welded steel structure, weighing 9,500 lb., built at an estimated labor cost of $350.

As may be noted in the side view of the apparatus, the tank placed in it has an odd shape, with a body roughly 12 ft. long and 8 ft. high and a long neck, about 10 ft. in length by 4 ft. deep, protruding through the yoke. The tank had a uniform width, in both body and neck, of about 2 ft. 4 in. Lifting lugs were welded to the tanks both at the sides and at the large end. When set in final position, the large end of the tank became the top, and the long neck protruded downward at the base.

Tanks were brought into the plant on flatcars and were lifted by means of lifting lugs on the sides on to temporary storage blocks. Because of the small

(Continued on page 166)

SMALL TOOLS ON CONSTRUCTION

ANCHOR HOLE FOR CONDUIT used on electric furnace at Chicago plant of Dodge Division of Chrysler Corp. is cut by Black & Decker electric hammer.

A special pictorial section illustrating applications of hand-operated and power-driven tools

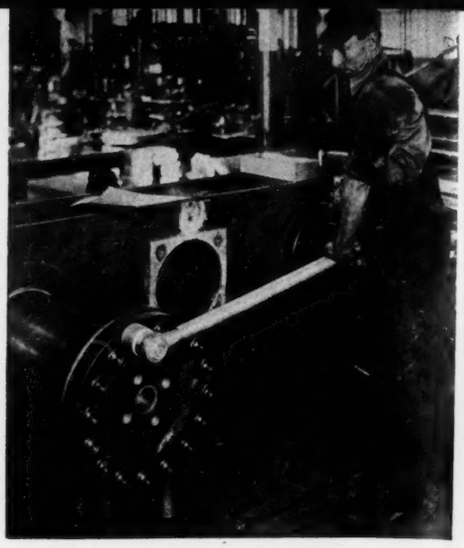
• For the eighth consecutive year, "Construction Methods" presents herewith a special section of close-up, on-the-job action pictures to indicate the wide range of useful, time-saving and cost-cutting applications which small tools offer to engineers and contractors.

While every large-scale project demands for its rapid and efficient prosecution a full quota of heavy-duty equipment, it likewise offers countless opportunities for the profitable use of small tools. It would be difficult to cite any kind of work that construction men are called upon to perform that does not involve such basic operations as sawing, drilling, jacking, cutting, pulling, pushing, turning, hammering, chipping, bending, grinding, tamping, boring, pipe-threading, bolting and surface finishing.

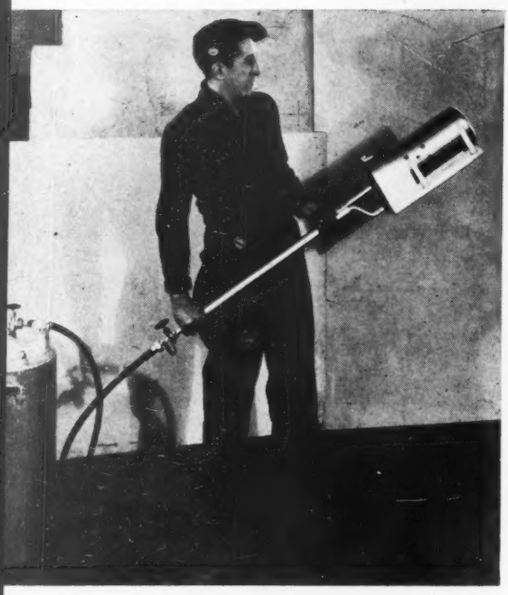
Here, then, is the field of small tools. Both in mechanical types, such as the portable electric or pneumatic saw or drill, and in the strictly hand-tool classification, such as wrenches, the makers of this equipment have provided tools to handle the entire gamut of such duties. The illustrations on this and following pages show the broad scope of operations essential to present-day construction that can be done with small tools.

Small Tools ON CONSTRUCTION

OIL PIPELINE SURFACE is freed of rust and other foreign material by special rig devised by Standish Pipe Line Co. near Carney, Okla. Rig consists of cradle fitting around pipe and riding on eight spring tension casters. Two Black & Decker 9-in. heavy-duty sanders are held in cradle at proper angle to apply flexible sanding disks.

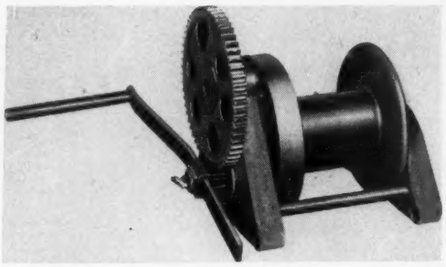


SOCKET AND RATCHET WRENCH SET made by Blackhawk speeds bolt tightening, as wrench combination is not lifted off nut for repeated new settings, as with rigid wrench.



SNOW, ICE AND FROZEN MATERIALS can be thawed out by hand-operated Aeroil heavy-duty outfit with 2,000-deg. F. flame. Blue-annealed steel pressure tank is of 10-gal. capacity and flame is 24 to 48 in. long.

SAFE HANDLING of heavy loads without creep is provided by American Handiwinch (below), all-steel hand-power unit equipped with removable crank which is adjustable from 10 to 20 in. Drum can be driven through 27-to-1 double reduction gears for loads up to 10,000 lb. and through 4.5-to-1 single reduction gears for loads up to 1,900 lb. Winch with crank assembly and tail yoke weighs 107½ lb.

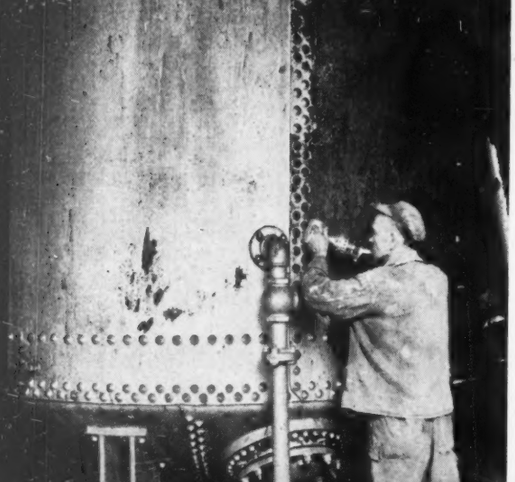


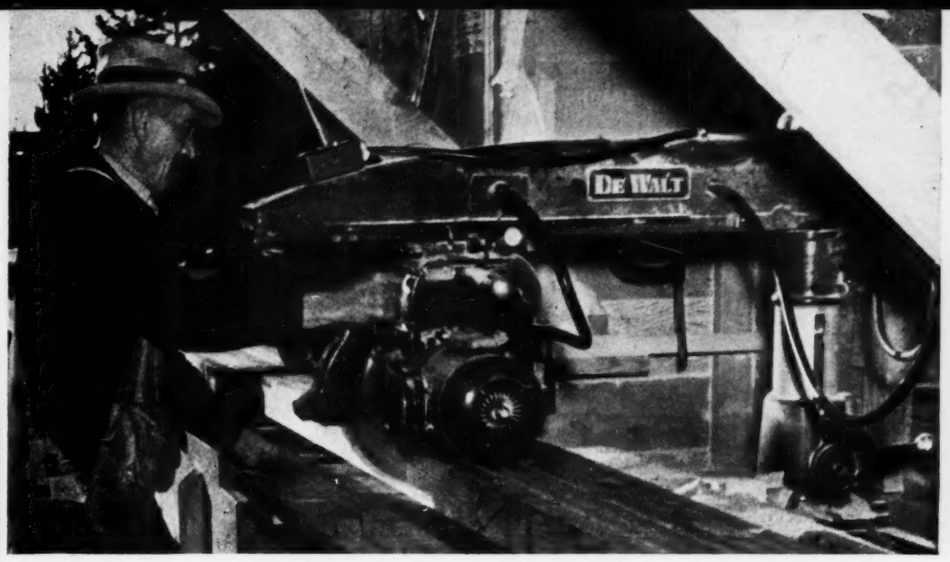
SUMP PUMP of Chicago Pneumatic make quickly removes water from pit. No priming is necessary, as pumping starts as soon as air is turned on and unit is lowered into water.

CONCRETE PAVEMENT (below) on Illinois street is cut by Barco gasoline pavement breaker. Exhaust blower attached to solid drill steel with six-point bit can be used with breaker when this power tool is to be used for drilling pavement as well as breaking it.

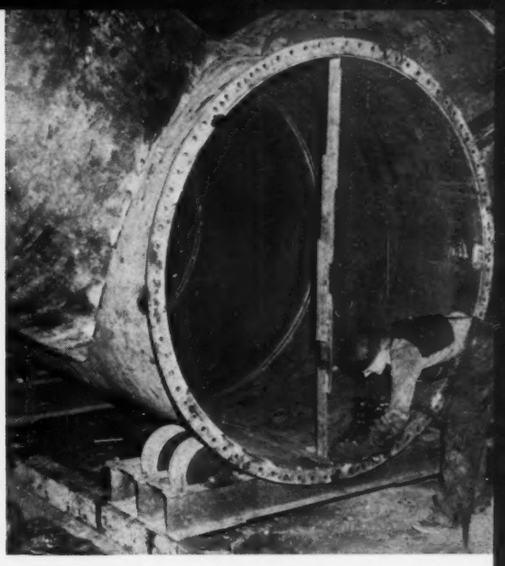
RUST AND PAINT are removed from steel surface by Aurand cleaning tool (below). Two cutter bundles containing loosely mounted cutters are revolved at high speed and centrifugal force causes them to be thrown outward and to strike the surface with effective result. Cutter contact is regulated by easily adjustable depth shoe.

PRECAST CONCRETE PILING (below) and interlocking riprap units are constructed on job site. Here piling is vibrated during casting process by Jackson flexible shaft concrete vibrator. Unit is powered by 1¼-hp. electric motor which is capable of driving head at from 7,000 to 10,000 vibrations per minute. Head is 1⅛ in. dia., and 10 in. long.

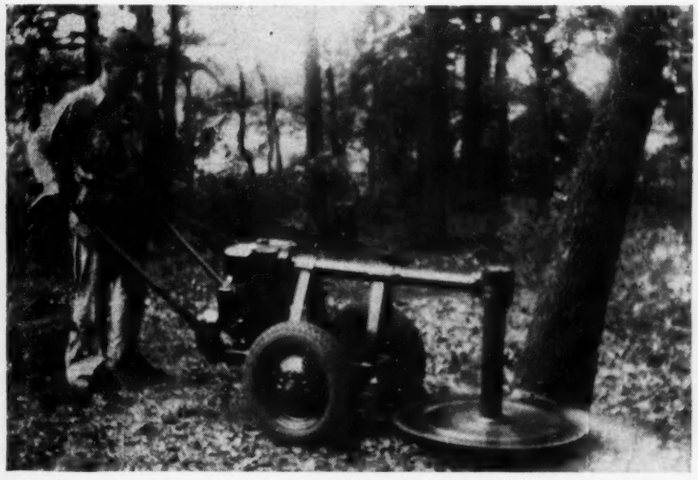




MULTIPLE CUTTING of 2x6 studding is accomplished in few seconds by 7½-hp. DeWalt saw.



PEENING OF WELD on large-diameter pipe is done with Cleveland air hammer.

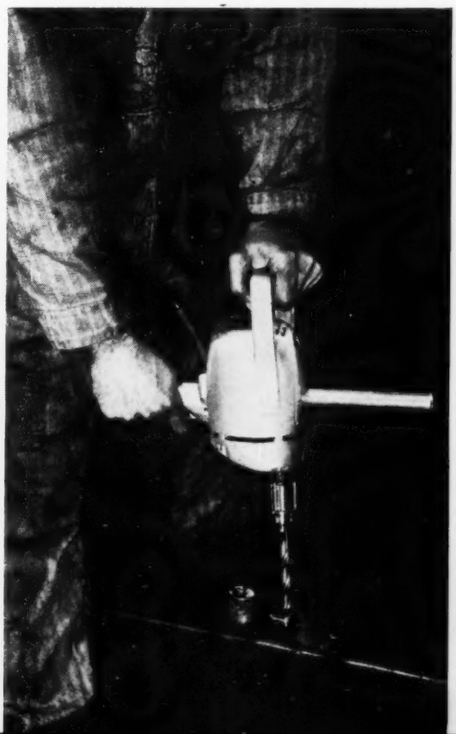


ONE MAN FELLS TREE using Jaques Junior portable power saw which can be changed to vertical position to cut timber to desired length.

HAZARDOUS JOB of applying clips to cableway system is done with Ingersoll-Rand impact wrench; absence of torque reduces danger of operation.

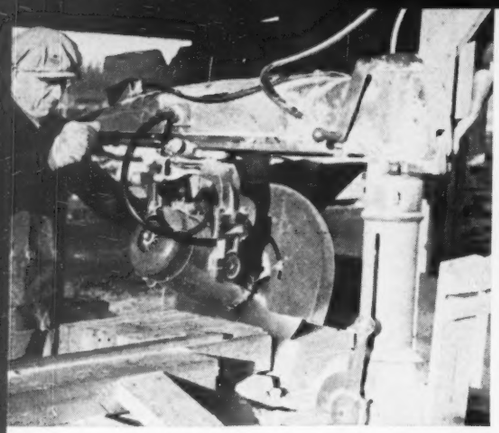
HEAVY-DUTY ELECTRIC DRILL (below) of Mall manufacture has ½-in. capacity in steel and 1 in. in wood.

VELOCITY-POWER RIVET REMOVER made by Mine Safety Appliance Co. is used on job. Punch is driven directly through rivet head to cut it loose from body and permit ready removal with hammer and drift. No auxiliary hose or wires are necessary, as source of energy is self-contained. Tool is lightweight and convenient in size and shape.

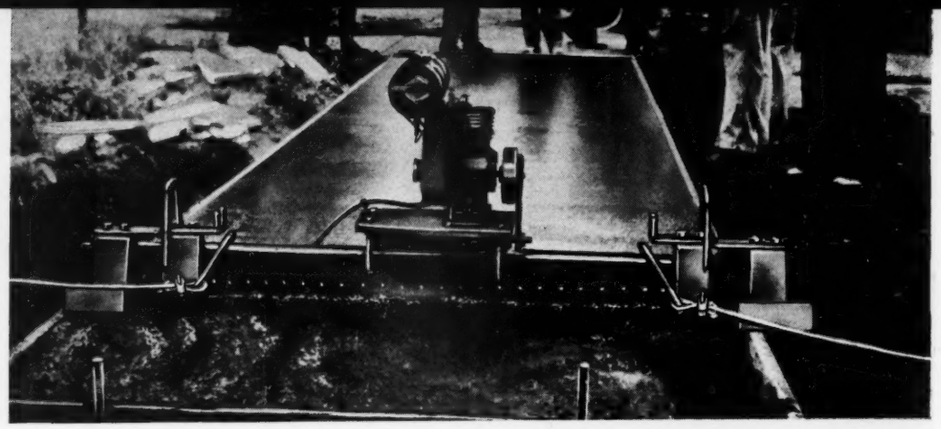


"UNSCREW DRIVER" (below) is used by Seabees to dismantle Quonset hut. Motor in Thor portable electric drill is reversed and shank from 8-in. screw driver is inserted in drill socket making it possible to remove metal screws from hut framework five times as fast as can be done by hand.

Navy Department Photo



SINGLE STROKE of 20-in. DeWalt saw blade tilted at angle cuts eight rafters in 10 sec.



SIDEWALK IS FINISHED with Master vibratory finishing screed powered by gasoline engine. Unit provides accurate strike-off and compaction of concrete in single operation with no additional vibration.

Small Tools ON CONSTRUCTION

Page 84

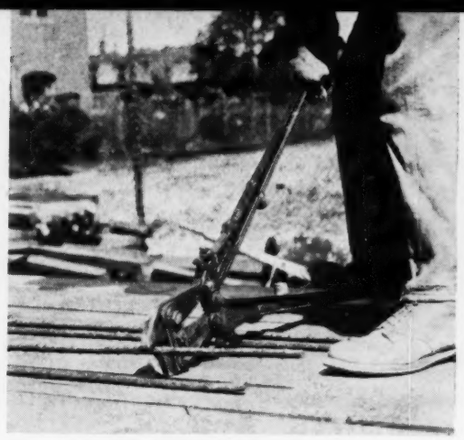
BUILDING MATERIALS are raised to roof level by Yale & Towne electric hoist (below).

SPRAYING 340 LB. OF STEEL on 2,300-lb. bronze sleeve with Metco hand gun restores 3-ton ram to operation in half time that would have been required to replace sleeve.

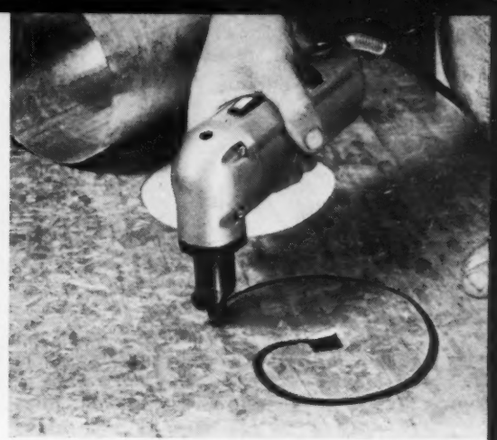
CLAMPED ON TO CONDUIT, Greenlee cable puller draws cable straight out to prevent loosening of conduit hangers or damage to cable insulation. Compact and portable, unit is operated by one man turning crank. It provides pull up to 7,500 lb. with two speeds.

LIMB IS CUT from felled tree with Disston chain saw (below) powered by Mercury gasoline engine. Various saw models range in weight from 93 to 149 lb.

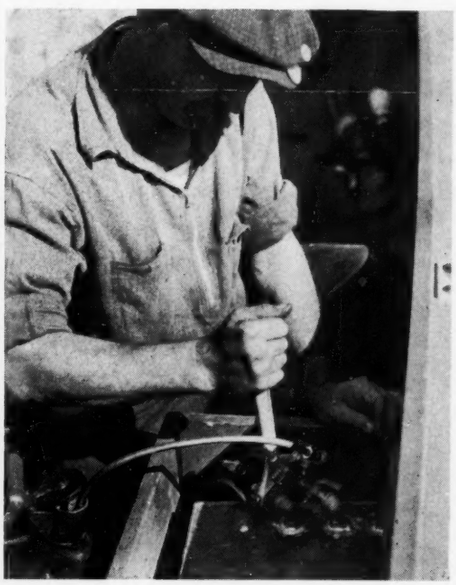
GLAZED TILE AND TERRA COTTA are cut by Clipper masonry saw. Of steel-frame construction, unit is completely portable and powered by electrically driven motor. Control is by foot pedal.



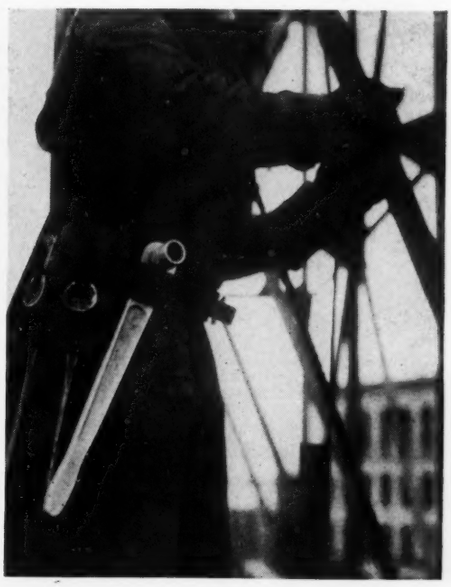
STEEL REINFORCING RODS are cut with Porter heavy-duty cutter which handles material up to ½ in. dia. in one movement of handle. Tool, 42 in. long, weighs 19½ lb.



ELECTRICALLY POWERED NIBBLER, made by Skilsaw, cuts hot rolled steel or galvanized iron up to 14 gage without distortion.



ADJUSTABLE WRENCH is indispensable tool in shipbuilding yards. This mechanic is using 10-in. Crescent Crestoloy for installing diesel oil tank in hull of vessel.



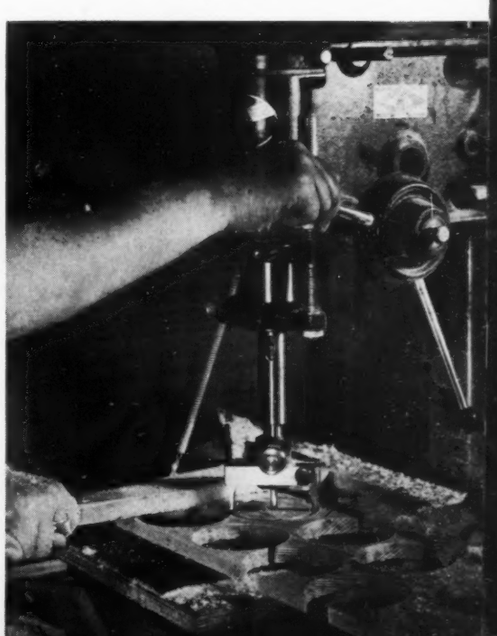
SOCKET WRENCH of Williams manufacture added to structural wrenches of same make in ironworker's belt speed bolting-up of steel frame for large sign requiring many bolts.

THIN WALL POURS are expedited by Viber flexible internal concrete vibrator with new 1¾-in.-dia. vibrating element which has high speed of 9,500 rpm. or 19,000 vibrations per min. Flexible casings which work into hard-to-reach locations come in 6-, 12- and 21-ft. lengths. Power may be pneumatic or gasoline as well as electric.

HAND SHOVEL (below) of Union Fork & Hoe Co. manufacture is made of steel which is surface peened after heat treatment to increase resistance to fatigue breakage from 2½ to 5 times.

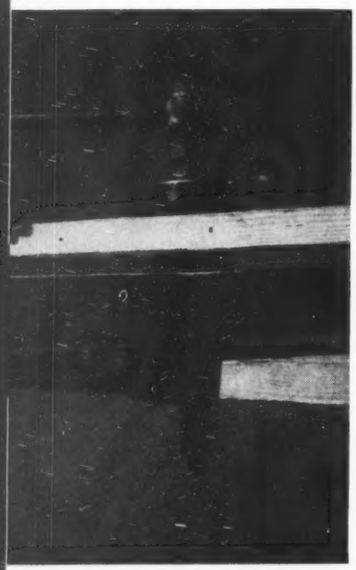
HOLES ARE BORED in metal by United States Electric Tool Co. ½-in. drill (below) with universal motor and chrome nickel steel gears packed in grease.

WIDE EXPANSION RANGE is provided by Clark two-blade adjustable flycutter (below) in Delta machine. Two models cover all diameters 2½ to 10 in.

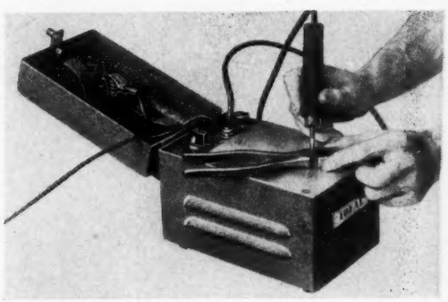


CHAIN HOISTS hold 12-in. fuel oil main in place for welding by Seabees in New Caledonia.

HOLE IN CONCRETE FOUNDATION is drilled by Syntron electric hammer.



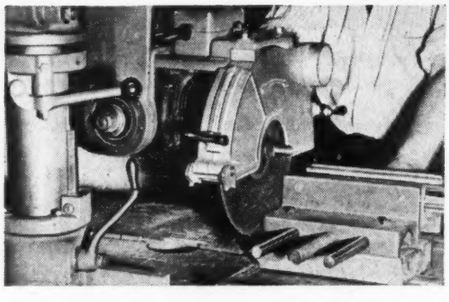
Small Tools ON CONSTRUCTION



IDENTIFYING MARK is burned into metal tool by Ideal universal etcher which has four heats, 120, 240, 420 and 700 w. Overall size of unit, which weighs 16 lb., is 7¼x5⅛x8½ in.

TIMBER JOINT is assembled with high-strength rod, oversize plate washers and ball-bearing washer; Teco toothed-ring connectors are placed between overlapped faces of wood members. Acme threads on rod and nut provide speed and efficiency in drawing joint together.

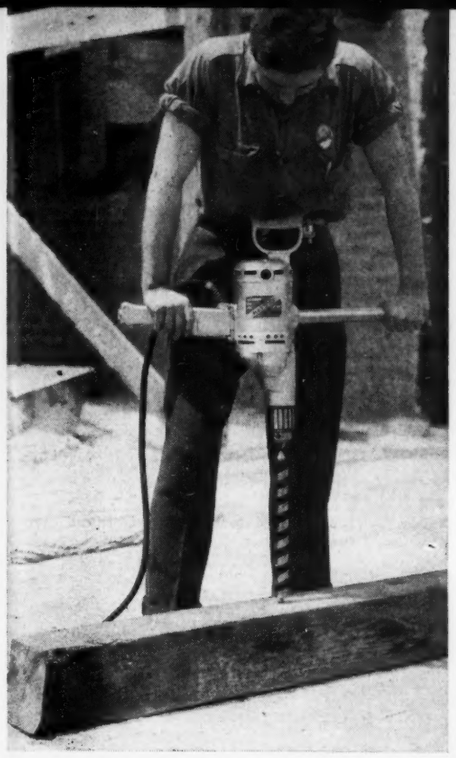
Page 86



METAL CUTTING is done with Walker-Turner radial saw.

FOUNDATION PILING at Galveston wharf in Texas is cut by 24-in. Reed-Prentice portable air-powered saw (below).

WAGON DRILLS (below) made by Cleveland Rock Drill Co. are used on railway relocation job.

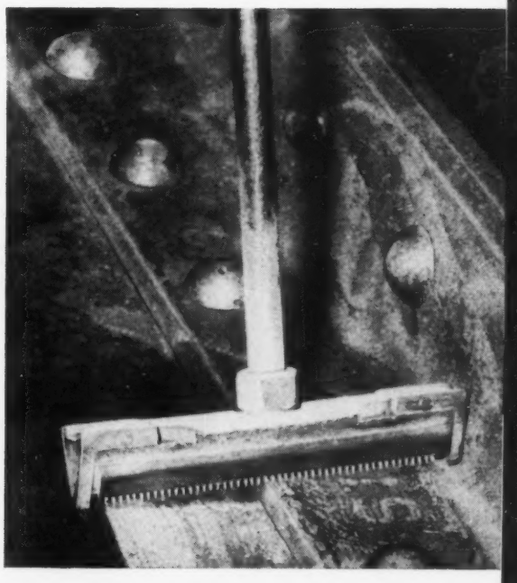


HOLE IS DRILLED by Skildrill which can bore up to 2 in. in hard wood and 3/16- to ¾-in. in steel.

TRACK LINING AND PLACEMENT on Chicago's street railway system is speeded by use of Simplex track jacks.

FOR LIGHT, FAST CUTTING of metals this Crescent hacksaw is available in wide variety of patterns for various classes of work.

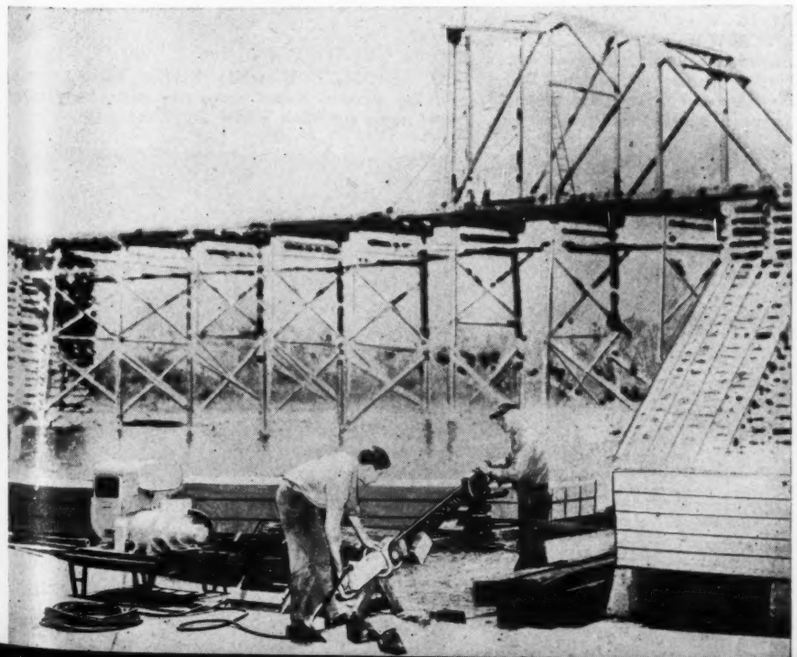
WELDED STEEL DECK PLATES are prepared for laying finish bead by veeing out joints with Thor pneumatic chipping hammer which weighs 12 lb. and has 2-in. stroke and 1½-in. bore.



ACETYLENE FLAME BRUSH loosens and flakes off rust and scale from steel surface leaving it ready for painting. Linde Air Products Co. Photo

TIMBERS FOR BRIDGE CONSTRUCTION are prepared by Atkins portable electric chain saw (below) with power supplied through Mine Equipment Co. molded rubber cable connectors. Threaded coupling-type connectors with shield caps are used on cable between generator and control box, while push-pull six-conductor types are used on cable between control box and saw.

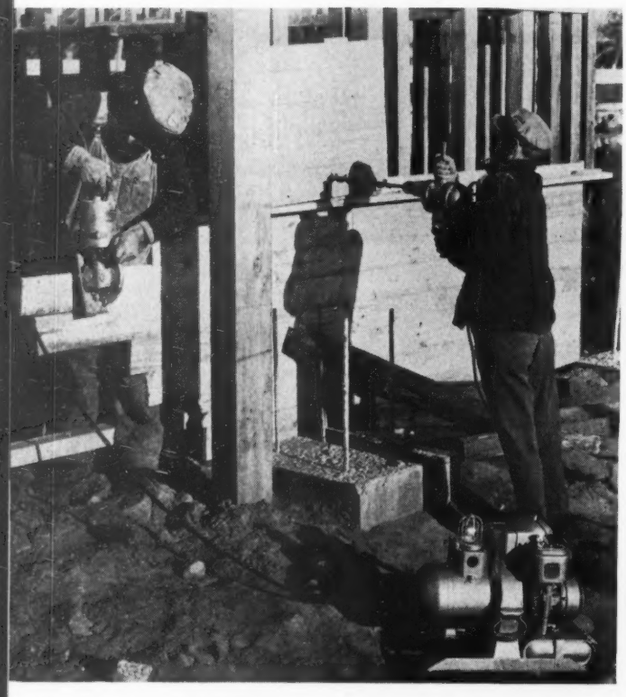
CONCRETE IS PLACED in Tee-Grid bridge floor with Baily vibrating pad (below). Steel plates piled on top of apparatus prevent pad from jumping up and down and maintain it in close contact with concrete. Mass of plates is varied to accommodate conditions of operation; weight is supported upon rubber mountings which dampen transmission of vibrations from pad to pile of plates.



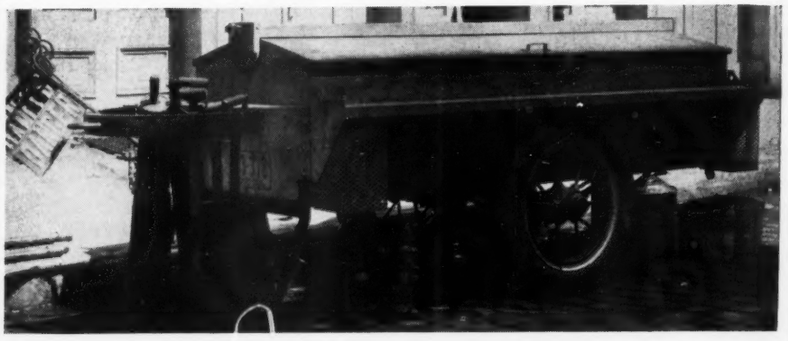
Small Tools ON CONSTRUCTION

SEABEE CAMOUFLAGES Quonset hut in South Pacific using DeVilbiss spray painting equipment.

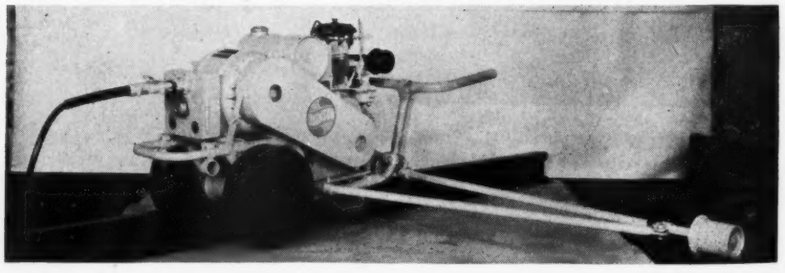
PORTABL
struction
lb., ¼ to



ELECTRIC SAW AND DRILL used on concrete forms are powered by Homelite portable generator. This model delivers 2,000 w. at 120 v. and weighs 105 lb.



ROAD MAINTENANCE TOOLS are stored in portable metal HanDee Box made by Littleford Bros. to facilitate highway work.



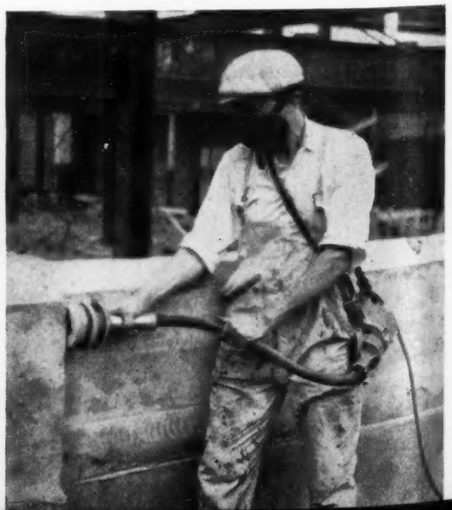
PERMANENT MAGNET ROTOR and stationary outer armature are included in generator of new Jackson portable gas electric power unit, thus eliminating need for commutator, collector rings, brushes or revolving windings. Unit is equipped with outlet box embodying one three-phase outlet, one Twist-Lock type Hubbell receptacle and two Twist-Tight single-phase Hubbell receptacles.

FLOOR SA
make are p
This one-cy
alternating
from 350 to

ACTING AS HOLDING FIXTURE during welding operation Simplex Util-A-Tool (below) closes longitudinal seam of this pipe segment by holding with lugs on nut ends. Device also can be used with chains or hooks fastened to nut ends.

TRIPLE-PURPOSE SCREW-DRIVER TOOL (below) has power-arm arrangement which gives extra power to unlock rusted screws. In reverse, Tuffy, made by Swallow Airplane Co., makes possible last quarter-turn pressure needed to tighten screw.

FOR PROTECTION while buffing cement wall, worker (below) wears respirator and safety goggles made by Mine Safety Appliances Co.



PORTABLE PIPE MACHINES operated by electric power cut, ream and thread pipe on factory construction job. Larger Oster machine weighing 300 lb. handles diameters from ½ to 4 in.; smaller, 150 lb., ¼ to 2 in.

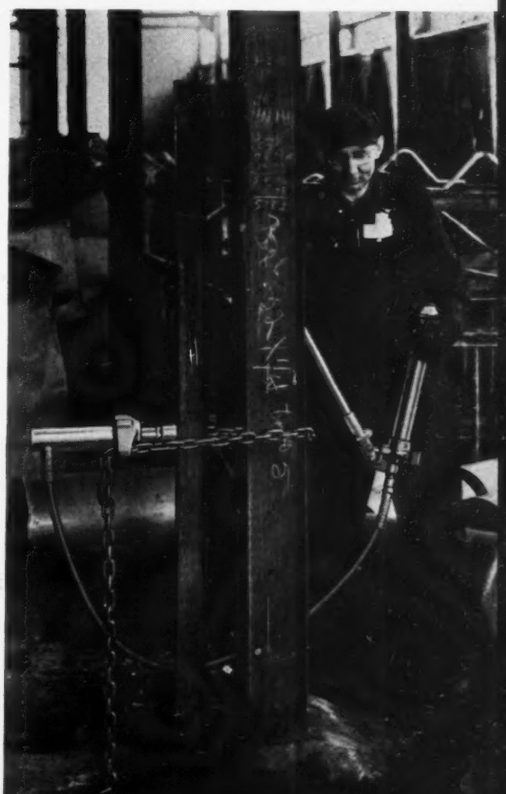
ABSORPTIVE LINING is fastened to form at Norfork Dam with Bostich stapling gun.

FLOOR SANDER AND POLISHER UNITS of Hilco make are powered by Onan 1,500-w. electric plant. This one-cylinder, air-cooled engine operates on alternating current. Other models provide service from 350 to 10,000 w.

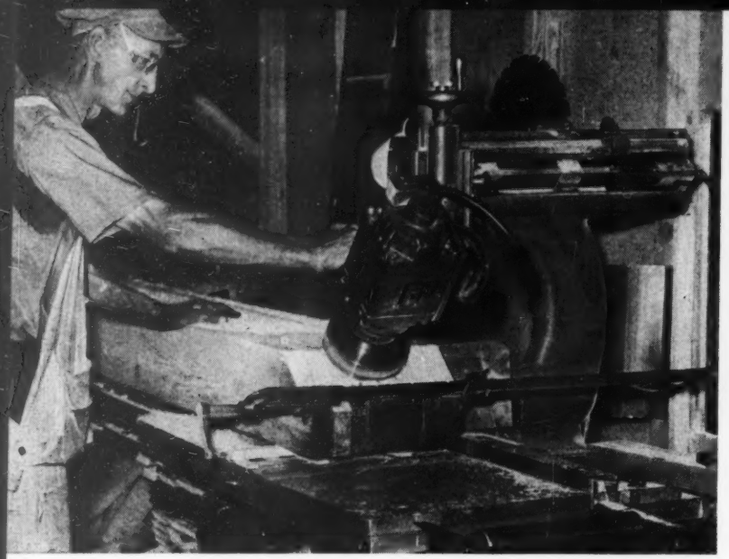
INDUSTRIAL CAN OPENER is this O'Brien steel drum opening tool which quickly cuts away top of steel barrel or other metal container, leaving smooth, even edge. Made of steel drop forging, it is 23½ in. long and weighs 5½ lb.

DANGER OF SPARK in handling explosives is minimized by use of Ampco safety tools made of nickel alloy which also has high resistance to corrosion.

BUILDING COLUMN, damaged during construction work, is straightened with Blackhawk Porto-Power hydraulic jack (below) equipped with attachments which adapt ram to pulling.



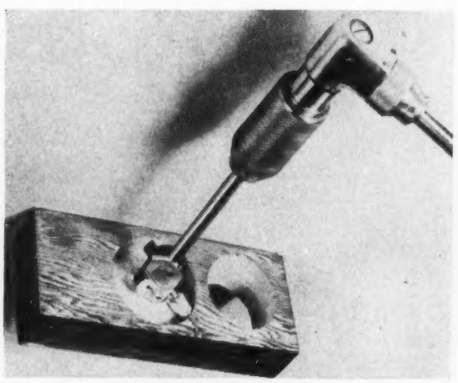
← **SURFACE FINISH** on concrete for driveways and walks of housing project is obtained by use of Whiteman rodding or screeding unit.



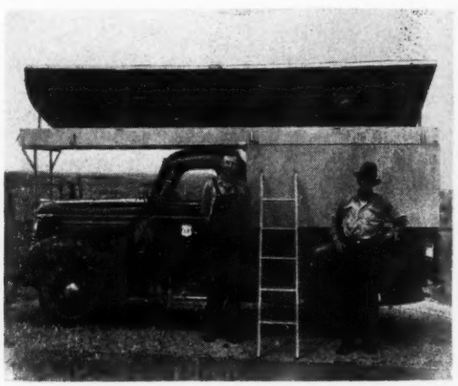
NOTCHES IN EIGHT RAFTERS are cut with one stroke of telescoping ram of Monarch uni-point radial saw in 8 sec. actual cutting time. Motor is fitted with special four-knife counterbore rafter notch cutter which cuts both angles at same time. Including setup work, piling lumber and other preparatory motions, 286 notches can be cut in 1¾ hr.

RUST-PROOF COATING is applied at Port Hueneme, Calif., Naval Base to metal parts of six-wheel International truck prior to shipment to Pacific war theaters for use by Seabees. Paint spray guns quickly apply different compounds to such parts as chassis, motor, ignition and cooling systems and mufflers to protect them from salt water and excessive moisture.

Small Tools ON CONSTRUCTION

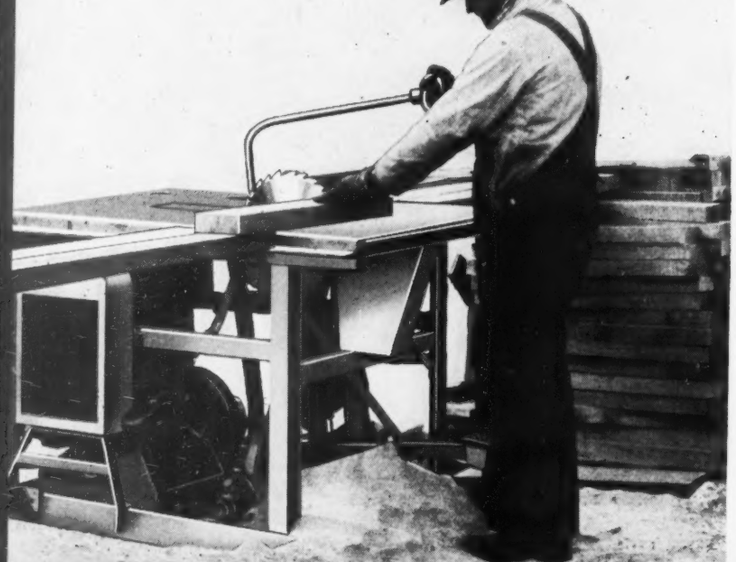


TO PREVENT SLIPPING and insure accuracy in cutting, Bruno expansive bit employs new method of holding adjustable hole cutter blade either in hand brace or in power drill.



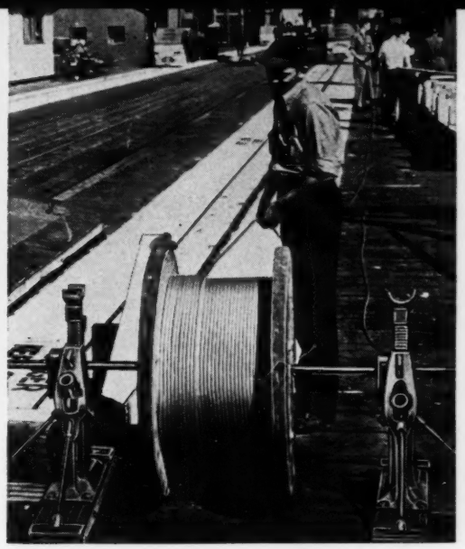
SPECIAL TRUCK BODY for carrying hot line tools, constructed by force at Green Mountain Dam, is used on Greeley-Fort Morgan transmission line. Roof is raised to open compartment for long tools.
Bureau of Reclamation Photo

LABOR OF 20 CARPENTERS is saved by cutting all concrete form lumber for Milwaukee brewery addition with C.H.&E. saw rig (below). Outfit is equipped with 15-hp. 4-cylinder LeRoi engine and 20-in. saw. Ripping capacity is up to 6-in. lumber.



GREASE, GRIT AND GRIME are removed from Allis-Chalmers tractor by Siebring portable steam cleaner (below).

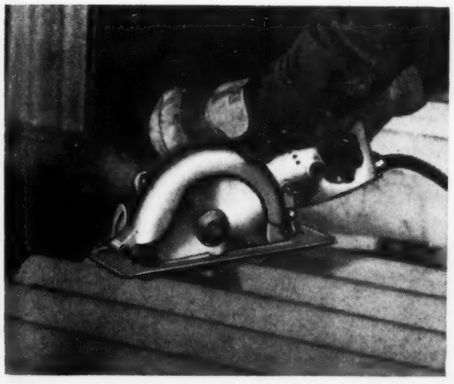
FOOTLOCKER SURFACE is sanded by Porter-Cable take-about surfacer, portable, electric hand sander-grinder on which endless abrasive belt operates over flat shoe.



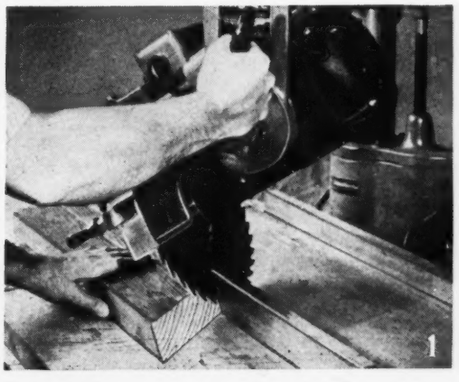
CABLE REEL JACKS of Duff-Norton make are used in shipyard. Laminated oak bases have adjustable tierods for rigid support. Jacks have right- and left-hand bases.

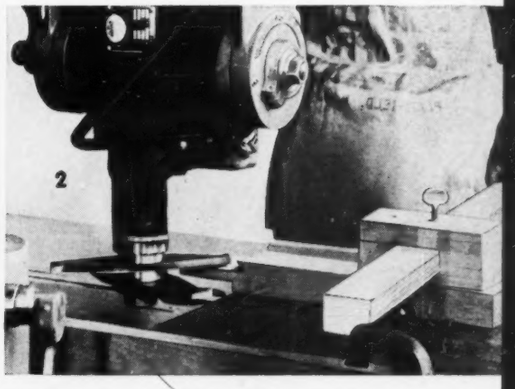
PLANKING IS APPLIED to 78-ft. motor torpedo boat with screw driver bit and Stanley bit brace.

OWI Photo



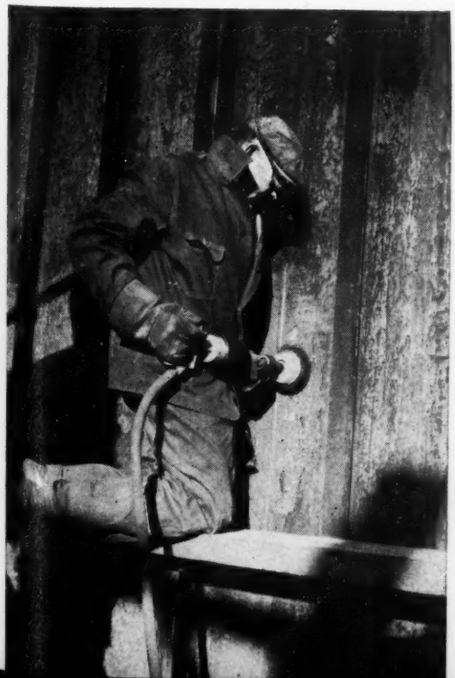
CORRUGATED ASBESTOS SIDING is cut by Van Dorn electric saw equipped with abrasive disk. Saw can cut to depth of 2⅝ in.



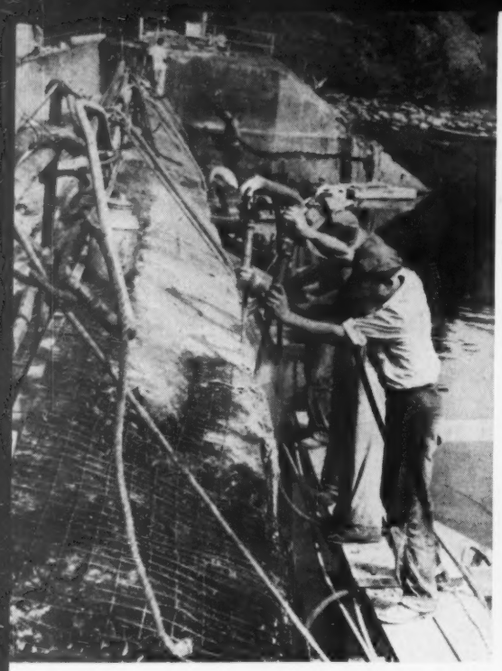


TIMBER IS CUT by Walker-Turner radial saw (photo 3) with speeds of 3,000 to 3,450 rpm. Universal head simplifies complicated cuts and gliding ram permits full view of work. Cast-iron stand has now replaced stand shown. In photos 1 and 2, saw is doing compound mitering and tenoning.

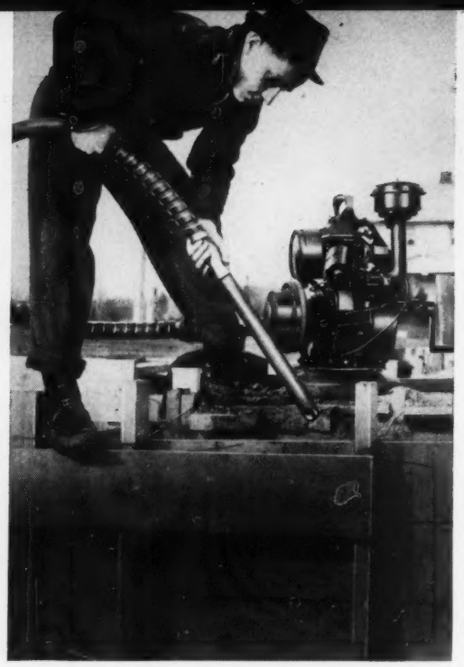
WIRE BRUSH is attached to Ingersoll-Rand air-powered grinder (below) to clean up welds.



SECONDARY BLAST HOLE is drilled for large rock excavation job by Chicago Pneumatic light sinker drill (below).



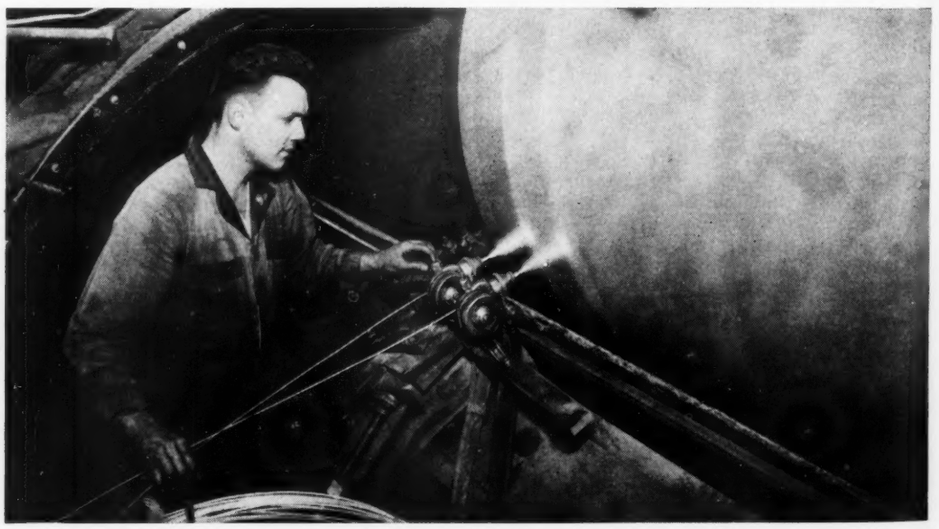
CONCRETE FACING OF DAM is chipped off with Thor pneumatic "core-busters" preparatory to re-surfacing. Hammer has 4-in. stroke and weighs 15½ lb.



INTERNAL VIBRATION of concrete in building foundation is provided by Master gasoline-powered flexible-shaft vibrator.

SHORT TRENCH accommodates Greenlee hydraulic pipe pusher for pushing pipe under pavement, thus eliminating tearing up, tunneling, backfilling, tamping and repaving. Unit weighs 140 lb. and can be operated by one man or may be power driven. Made in two sizes; pushing pressures range from 6,500 to 40,000 lb.

Small Tools ON CONSTRUCTION



CORRODED CAST IRON DRYER DRUM is rebuilt in position by metallizing with two Metco hand guns mounted for mechanical operation.

PIPE IS BENT ON JOB by Blackhawk Porto-Power pipe bender (below) to eliminate delay in awaiting factory-formed elbows.

STRUCTURAL TIMBERS are shaped by Black & Decker 9-in. heavy-duty sander (below) with rotary planer head.

GRANITE BLOCK PAVEMENT of street railway system is removed by Cleveland paving breakers (below).

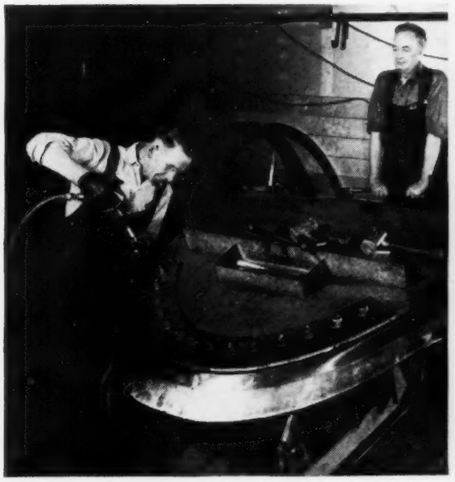
Small Tools SERVE SHIPBUILDERS ON MANY TASKS

THE WIDE RANGE OF APPLICATIONS of power-driven hand tools in shipbuilding operations is illustrated by these photographs, taken especially for "Construction Methods" at the Portland, Ore., yards of Kaiser Co., Inc.

SURFACE IS SPRAYED with DeVilbiss gun.

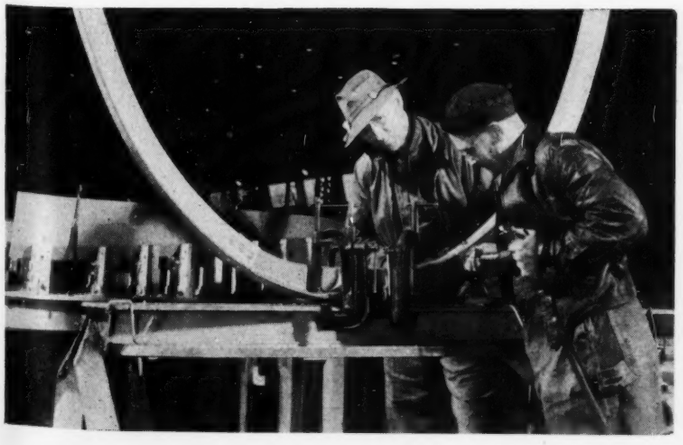
ALUMINUM RIVETS are driven with Ingersoll-Rand pneumatic tool. Girl in background is drilling with Thor ¼-in. heavy-duty drill.

PNEUMATIC RIVETER and bucking bar are used to join steel plates. Hammer is made by Chicago Pneumatic Tool Co.



YARD-MADE STRETCH DIE PRESS is worked on with Chicago Pneumatic ring valve air hammer.

ELECTRIC DRILL of Thor manufacture is equipped with countersinking device.



← RIVETS ARE DRIVEN with ⅜-in. capacity Ingersoll-Rand hammer.

→ STEEL SURFACE is cleaned with yard-made steam - and - compressed air scaler.

Well-Tooled Job Shops

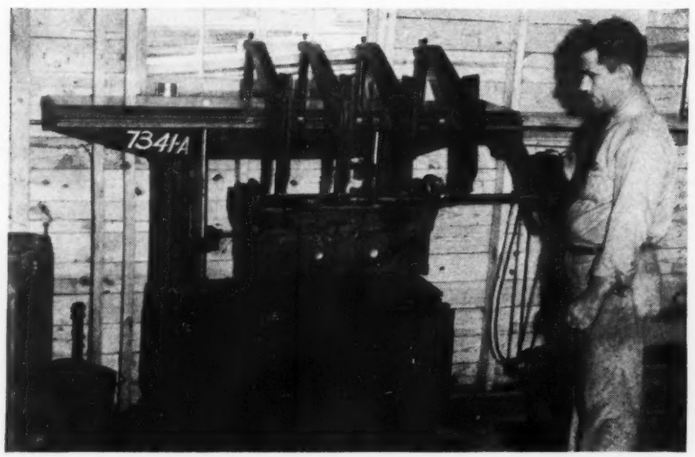
MAINTAIN 4,300 PIECES OF EQUIPMENT

IN AUTOMOTIVE SHOP, rebuilt Chevrolet engine is replaced in front end of truck by means of Wright 2-ton chain hoist hung from Yale 1-ton spur-geared trolley unit.

KEEPING 4,300 PIECES of war-worn equipment in operating condition was the difficult task capably discharged by four maintenance shops set up on the project by contractors for the $100,000,000 Naval Ordnance Plant at Shumaker (near Camden), Ark., built under the supervision of the Bureau of Yards and Docks as described in *Construction Methods, Sept. 1945, p. 96.* Accompanying photographs show some of the facilities and tools utilized in the shops by maintenance personnel of the main construction contractor, the WHMS group (Winston Bros. Co.; C. F. Haglin & Sons, Inc.; Missouri Valley Bridge & Iron Co.; Sollitt Construction Co.) and of the concrete contractor, the M. J. Boyle Co.

Three WHMS Shops—For the WHMS group, about 2,650 pieces of construction equipment and 1,400 pieces of automotive equipment were serviced and maintained in good running condition by three shops, for heavy equipment, automotive units and tires. All work on gasoline engines was performed in the automotive shop, where the total of major and minor jobs amounted to about 1,000 per week, of which 250 to 300 could be classed as major.

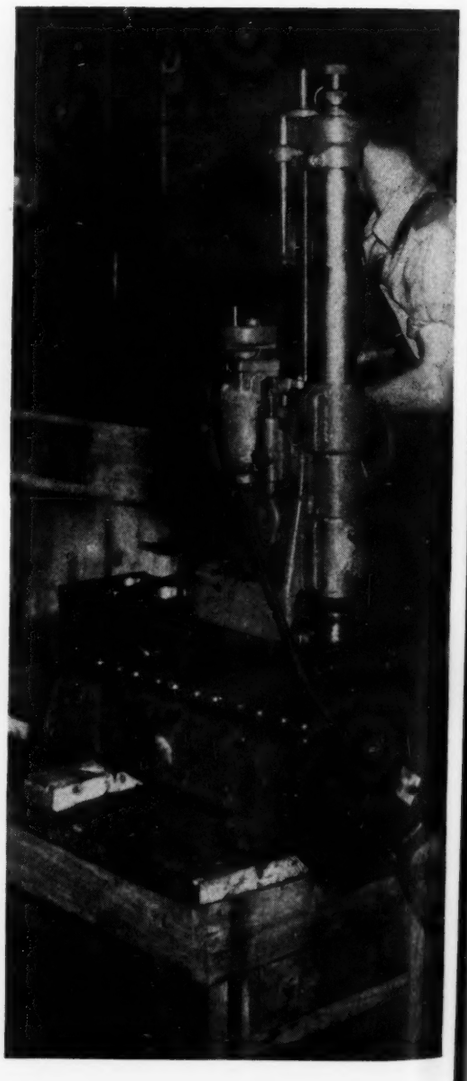
Diesel engines and heavy equipment were repaired and rebuilt in the heavy equipment shop, which was liberally equipped with machine tools, in addition to welding and blacksmith departments, to handle large work. Because of the size

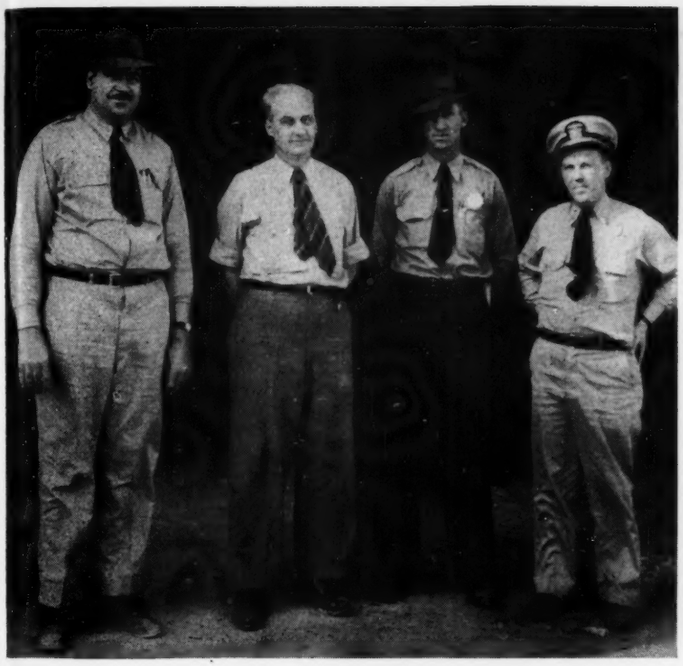


REVOLVING MOTOR STANDS (below) facilitate hand work by mechanics in making engine repairs. By stepping on pedal, turning mechanism is released to permit engine to be revolved into desired position. Motor stands were built in shop in accordance with design by O. R. Ross, motor room foreman.

LINE BORING BAR OF Tobin-Arp manufacture line-reams main driveshaft bearings of Chevrolet engine, one at a time. This machine can ream semi-finished insert bearings to fit undersize shaft.

VERTICAL BORING BAR (right) powered by electric motor bores 3 9/16-in. cylinder in engine block. This Kwik-Way boring bar will bore cylinders up to 4½-in. dia.





EQUIPMENT MAINTENANCE comes under supervision of these men: (Left to right) C. C. KECKRITZ, superintendent of equipment, and M. J. CROSSETT, general superintendent of equipment, for WHMS contractor group; KEN H. MILLER, principal inspector for heavy equipment, and Chief Warrant Officer R. N. BAROUX, assistant construction superintendent in charge of equipment, for Bureau of Yards and Docks, Navy Department.

AUTOMATIC PISTON GRINDER bearing Van Norman name has two principal uses in this shop: (1) It grinds semi-finished pistons to size, and (2) it grinds used oversize pistons to smaller standard size.

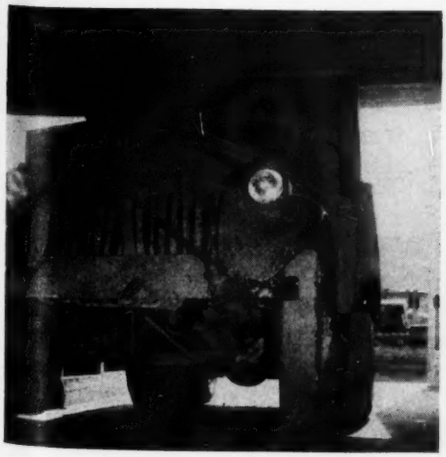
of the repair and rebuilding jobs performed in this shop, the total of major jobs per week was much less than in the automotive shop, ranging usually between 30 and 40.

Full facilities for tire repair and replacement were provided in the tire shop. All the shops were fully equipped with hand tools and power tools to speed the work of dismantling, assembling and adjusting equipment. Of the automotive units employed by the WHMS group, about 1,200 were trucks of various types and sizes from ½- to 10-ton, and the remainder were passenger-carrying vehicles. In the heavy equipment classification about 2,000 pieces were lighter units such as power-driven saws and woodworking machines, pumps, light plants, concrete vibrators and electric welders. The heavier units included about 160 track-type tractors and about 60 pneumatic-tired wheel-type tractor units. Other types of equipment were in proportion.

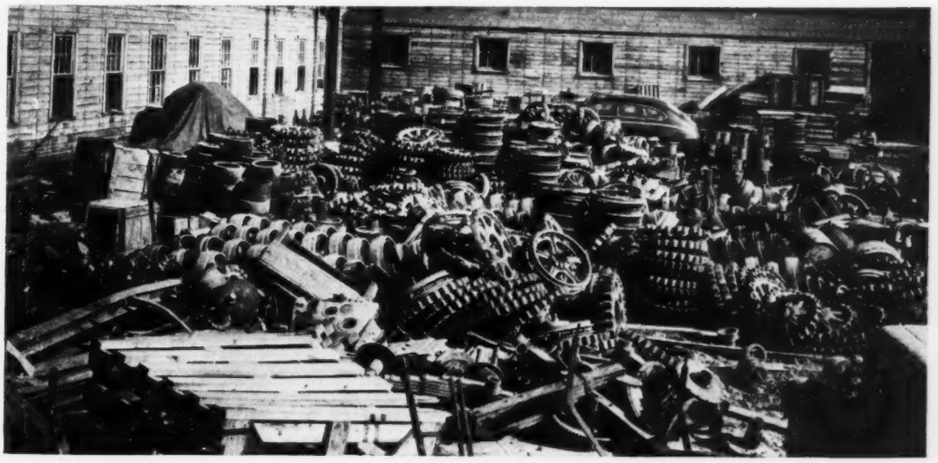
Truck-Mixer Maintenance — For de-

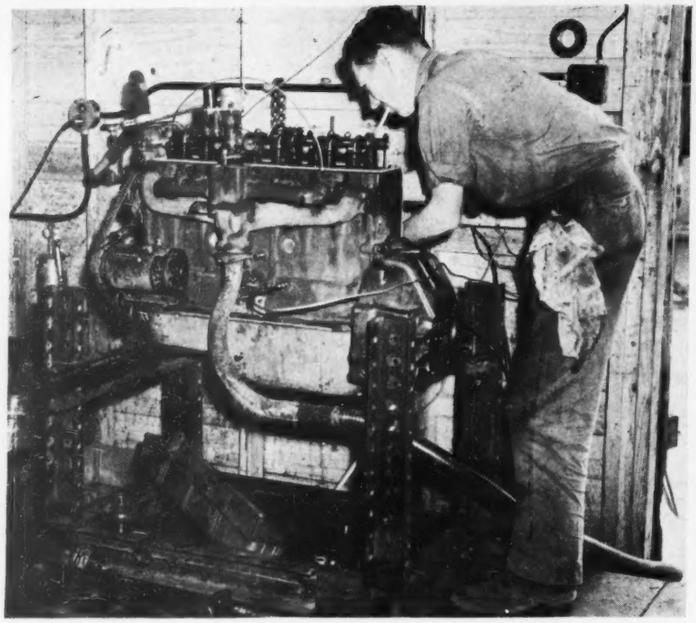
SHOP-MADE PRESS (right) incorporating Blackhawk 20-ton hydraulic unit is set up by WALTER J. HAMMOND, automotive shop superintendent, to speed work on press fits and other jobs requiring this kind of equipment.

TOW CABLES (below) bolted or welded to truck frames at about mid-points of these vehicles are one type of improvement made by automotive shop. These tow ropes, extending to both front and rear of trucks, reduce strain on frames in pulling heavy carriers out of mud during extremely wet weather encountered in first 6 months of job.



LARGE STOCK of tractor parts (below) is on hand to make replacements as speedily as needed, thus reducing lay-up time for making repairs.





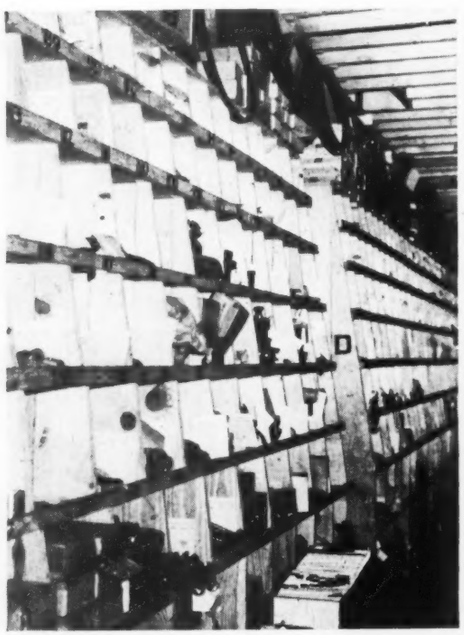
ENGINE TEST STAND of universal type, adjustable to fit any gasoline motor, serves as testing station where repaired and rebuilt engines are subjected to 3- or 4-hr. run at low speed—not at idling speed—before being replaced in trucks. During test, mechanics set timing, adjust valves, tune up motor, and check for oil, water and gasoline leaks.

HEAVY EQUIPMENT SHOP takes down diesel engine of D8 tractor for general overhaul calling for installation of all new parts, including new crankshafts, pistons, sleeves and valves.

livery of 220,000 cu. yd. of concrete on the 110-sq.mi. site, the M. J. Boyle Co. had available on the job a huge fleet of 248 truck mixers, of 2- to 6-cu.yd. size, assembled from many parts of the United States. The trucks were of various ages and models, and their condition ranged from fairly good to pretty bad. Maintenance of all these truck-mixer units was concentrated in a single shop equipped to rebuild motors, make diesel engine repairs, repair electrical equipment and tires, and lubricate the truck mixers. Space was provided to park 40 truck mixers in stalls under the roof of this shop. Machine tools were installed in a machine shop under the same roof to manufacture parts for old trucks, as it was extremely difficult to obtain parts from manufacturers for some of the older models.

Supervision—Naval officers in charge for the Bureau of Yards and Docks and civilians heading the WHMS project organization were named in the September article previously mentioned. At the

(Continued on page 138)

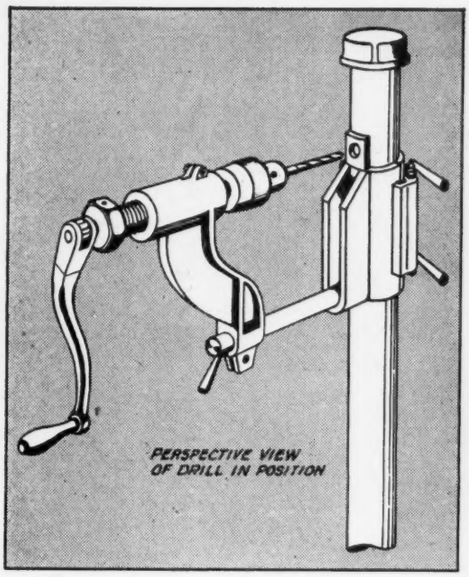


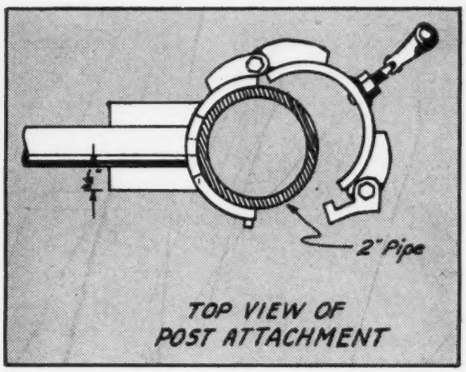
STOCKS OF PARTS are maintained in orderly arrangement and in as ample supply as possible on stockroom shelves. These bins hold parts for Cummins diesel engines in warehouse which provides separate sections for Allis-Chalmers, Caterpillar, International and Mack, as well as for cranes and excavators.

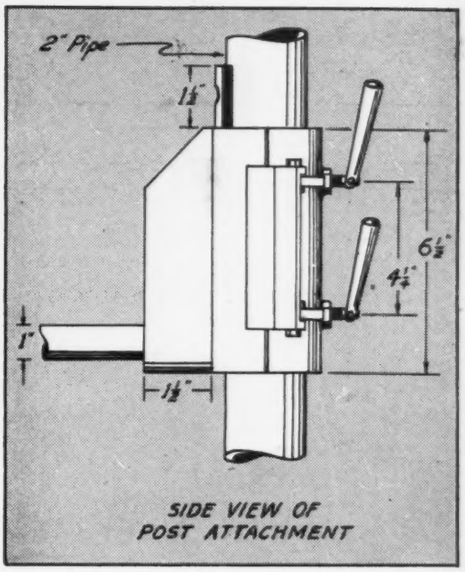
LARGE TRUCK-MIXER FLEET is serviced in this maintenance shop equipped with Yale spur-geared trolley hoists on I-beam rail over center aisle.

Special Attachment on Pipe Post

SUPPORTS RATCHET DRILL







SPECIAL ATTACHMENT, easily clamped to 2-in. post, provides steady support for ratchet drill used in cutting new holes for changed position of signs.

TO DRILL HOLES through metal posts for erection of highway signs in the field, District 19 of the Texas Highway Department, Atlanta, Tex., developed a special attachment, made in the district shop, upon which a Canedy-Otto ratchet drill can be rigidly mounted while the holes are being bored. The drill and attachment are light portable units which can be easily transported and used by a man in the field when making changes of signs on posts previously installed in permanent position.

As indicated by the top and side views in the accompanying drawing, the attachment consists of a clamp which closes around the post, with a gate on the clamp which latches automatically as the attachment is applied, leaving the hands free for tightening set screws on the back of the gate. The attachment carries a horizontal shaft on which the ratchet drill is mounted, as shown in the perspective view.

On the drill, a hand feed directly back of the ratchet handle makes it easy to manipulate the feed with the left hand as the handle is turned with the right hand. The drill has a three-point chuck with a capacity from 0 to ½ in. With the drill and post attachment, a workman can drill two holes in 4 min., greatly speeding and simplifying the work.

TO BE USEFUL, *Cost Figures* MUST BE CURRENT

By J. P. H. PERRY, Vice President, Turner Construction Co., New York, N. Y.

J. P. H. PERRY

A FUNDAMENTAL to the success of any construction operation is cost control. I think if I had to put one requirement which a contractor must have to be successful ahead of all others year in and year out I would put cost control — knowledge of costs and how to interpret them.

The time to use costs is when they are being made. Many contractors keep cost records in such shape they are available for use generally only at the end of the job and are primarily studied as a basis for bidding on or figuring the next job.

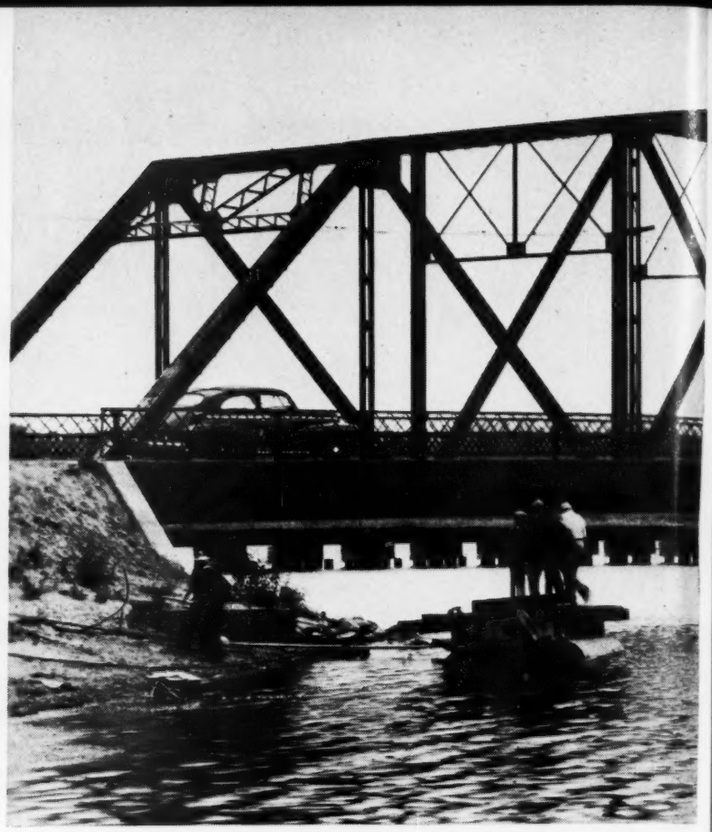
The theory of cost control from the inception of our company has been that while costs are useful as a basis for bidding the next job their greatest value is as a tool to control cost of work while it is in progress. We get out a "unit cost" every 2 or 3 weeks and an "indicated outcome" every 6 weeks on all our work.

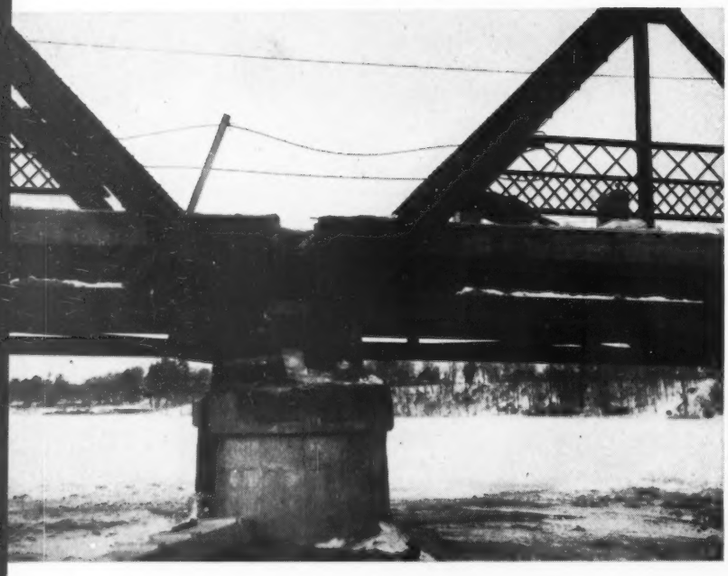
The "unit cost" is just what its term implies—a series of costs made for a current period on 30 to 100 or more items of work—bricklaying, making forms, placing forms, bending steel, removing forms, hoisting steel, laying finish, plastering, painting, and many more. These costs are related to the budget estimate which is set up at the inception of every job. If there is variation between estimated costs and actual costs the headquarters staff, through vice presidents or general superintendents, are in a position to apply corrective methods.

An "indicated outcome" is a projection of the unit costs on an empirical basis throughout the remainder of the life of the job. These projections are invaluable in controlling costs for all types of building work. For example, there may be a unit for the cost of laying common brick in the wall of $30 per thousand average for the whole job. This might mean that at the start of the work when the job hadn't yet been fully organized or when there were piece-meal operations the superintendent might be making a unit of $50 and the same again at the wind-up of the job. In order to average $30, therefore, the superintendent might be required to make at the peak of operations a unit of $20 or less. If he saw that he was getting a $30 unit in mid-stride he might feel complacent, whereas actually he was due for a headache when the final costs were in. These indicated outcomes have effected great savings.

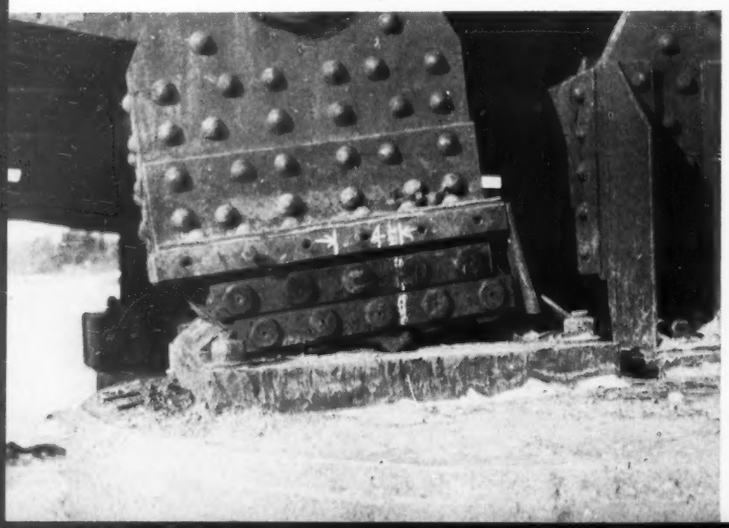
Ingenious Pier Replacement SAVES FAILING BRIDGE

By W. J. LaFLEUR
Assistant Civil Engineer, Construction Division, New York State Department of Public Works, Albany, N. Y.





MOVEMENT OF NORTH PIER causes expansion bearing under east truss of center span to tip forward. Bar (below) is welded across face of first roller to prevent sliding and collapse of nest. Rear roller is 2 in. above base plate.



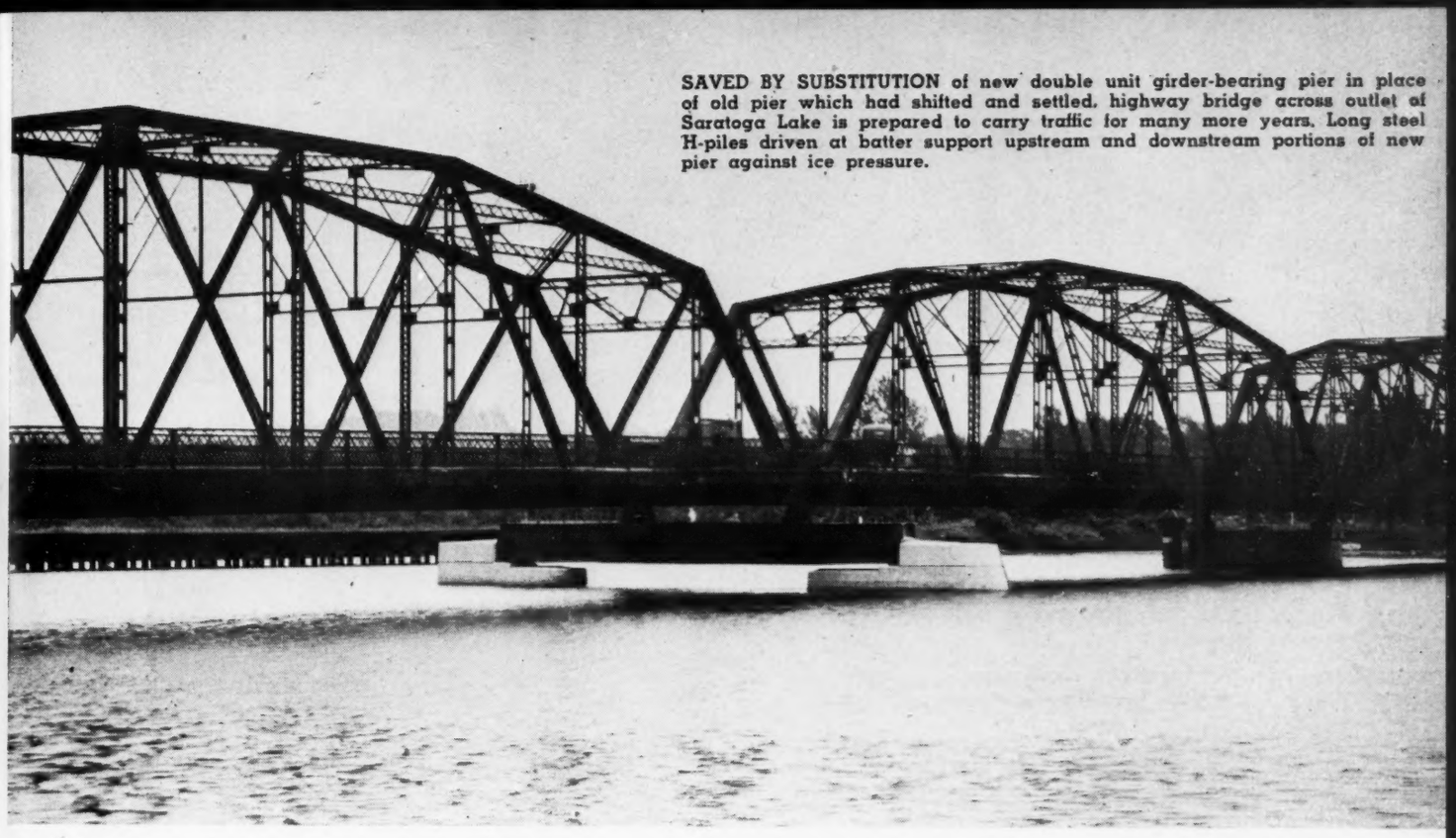
WORKING AGAINST TIME and in the face of all the hazards and obstacles of nature and of war, the construction division, New York State Department of Public Works, last year completed the salvage of a three-span through-truss highway bridge which appeared doomed to early destruction. To save the structure, Collins Brothers, contractors for the department, drove steel pile groups at the two ends of a faltering bridge pier and transferred the truss spans of the bridge to a permanent cross girder resting on the concrete caps of the new pile groups. Lifting girders on temporary pile supports were used in transferring the load of the truss spans to the new, substitute pier, and the whole operation was completed without closing the bridge to traffic. Accompanying photographs illustrate the sequence of operations.

Carrying an important two-lane highway over the outlet of Saratoga Lake, the structure consists of three, 200-ft. riveted through-truss spans. It was built in 1923 by Saratoga County and remained a county bridge until 1942, when the state took it over. All substructures are concrete, on piles. No subsurface information was shown on the original plans, nor could such information be obtained from existing county records. An accompanying drawing indicates the soil profile at one of the holes driven to obtain subsoil information in June 1943.

Movement of Pier

Lake level is maintained by a control dam several miles downstream from the outlet. An occasional combination of strong west winds and spring breakup of ice produces ice jams of considerable magnitude at the bridge. By April 1937 the action of these ice jams had resulted in a marked and alarming misalignment of the structure. The north pier had been moved 1.7 ft. to the east, in the downstream direction, carrying the north and center spans with it. Measurements were taken at several control points and recorded. In November of the same year, additional measurements revealed practically no further movement.

Five years later it was evident the north pier had moved again, for floor and railing details were in contact over the piers and were buckling under the pressure. Measurements made in May 1942 showed that the pier had moved 2.8 ft. out of line and had settled about 0.3 ft. as well. The state took over the bridge from the county June 26, 1942, and studies



SAVED BY SUBSTITUTION of new double unit girder-bearing pier in place of old pier which had shifted and settled, highway bridge across outlet of Saratoga Lake is prepared to carry traffic for many more years. Long steel H-piles driven at batter support upstream and downstream portions of new pier against ice pressure.

were begun to attempt to save the structure. Any method requiring substantial amounts of steel or timber was ruled out by the war.

It was found that the north pier stood in about 33 ft. of water. Plans for the structure indicated that the pier was founded on vertical piles. No batter piles had been provided in the design. The pier had not tipped but rather had drifted endwise and was still virtually erect. It was realized that the problem involved some delicate balances in the pier, piles and substrata, including even the friction between superstructure parts in contact over the pier.

Methods Considered

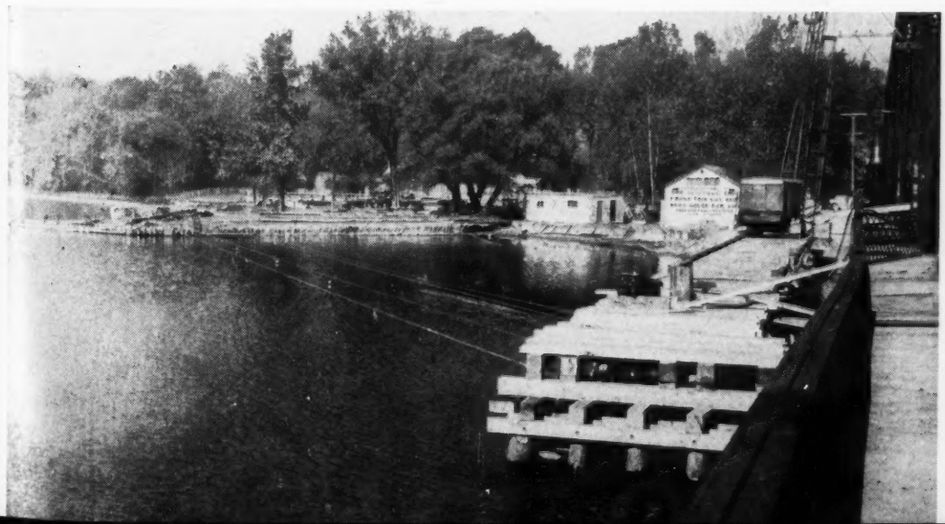
To lose the bridge by default was unthinkable. Various methods were explored. The first possibility suggested was to pump grout under and outside the footing after establishing a restraining cofferdam. It was realized that the water was deep and the driving of sheeting under the bridge, with only a few feet of clearance above the water surface, presented difficulties. After completion of the borings, the grouting idea had to be abandoned completely. An examination of the soil profile discloses the reason. The bottom of the footing was at El. 165, with 13 ft. of muck and 6 ft. of clay below it.

By February 1943 the expansion bearing under the east truss on the north pier had tipped forward, and a bar stop was welded along the front face of the first segmental roller to keep the bearing from tipping or sliding off the base plate.

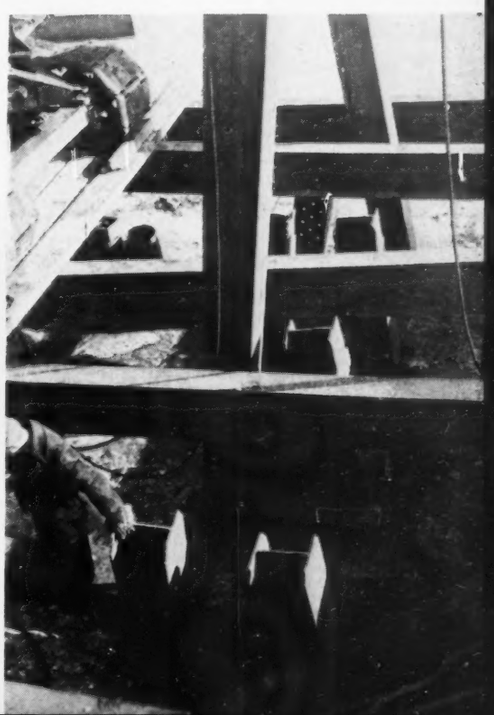
An exploratory boring was made in May and June. The hole disclosed 19 ft. of muck, 6 ft. of clay and various sand layers down to 124 ft. below top of pier, where the boring stopped in gravel without ever encountering rock.

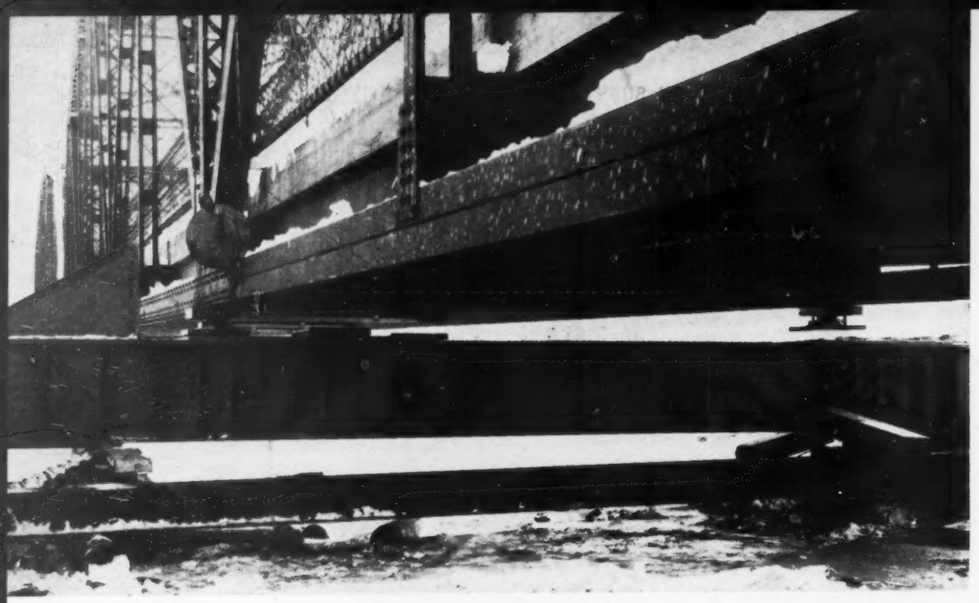
In a confused war-time market, it seemed expedient for the department to buy the required timber and timber piles and to let a contract covering the work and the steel involved. The engineer's estimate for the contract work was $81,751.

CONSTRUCTION RUNWAYS on timber pile bents (below) are constructed on both sides of bridge from north shore to second panel point in center span, beyond north pier. Wire-rope cables extending at left from north pier to concrete deadman on shore were installed to restrain pier against further downstream movement during ice breakup of previous spring. Cables are looped around cylindrical ends of existing pier.

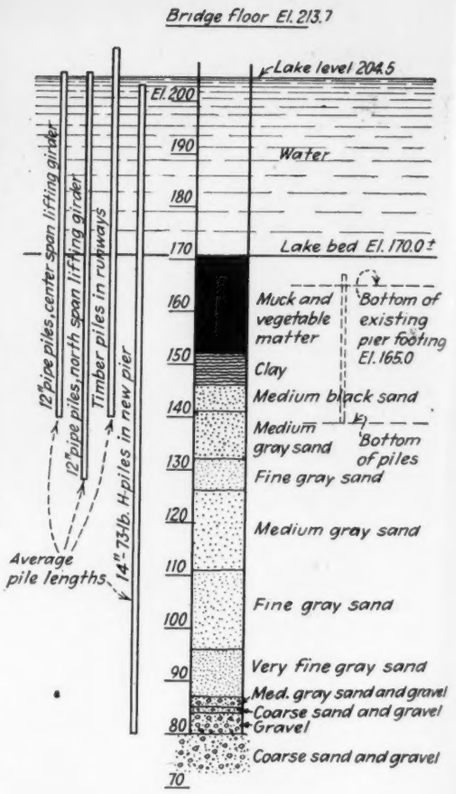


STEEL H-PILES (right) 120 ft. long are driven in groups at two ends of existing pier by cranes on temporary trestle runways.





TEMPORARY LIFTING GIRDER is installed on concrete caps of pipe-pile clusters driven close to bridge trusses at second panel point from pier—in both center span and north span. Original salvage plan calls for two spans to be raised by means of these lifting girders while pier is being replaced, but additional settlement of pier reduces clearance at two lifting girders and causes change of plan. Frozen surface of lake aids winter work, but low temperatures hamper operations.



EXPLORATORY BORING at pier site (right) reveals soil strata ranging from muck in lake bottom, through clay and various layers of sand, to coarse sand and gravel at depth of 124.5 ft. below lake level. Plans call for 12-in. pipe piles to support temporary lifting girders under two spans and for 120-ft. H-piles to carry permanent girder at pier location.

AFTER PIER HAS SETTLED still further in midst of salvage operations, bridge crew is compelled to raise spans by jacking on this pier until sufficient clearance is obtained to permit transferring loads to temporary lifting girders, one of which appears in background. Jacking is successfully completed without disastrous settlement of failing pier.

Timber piles and lumber came to $13,000.

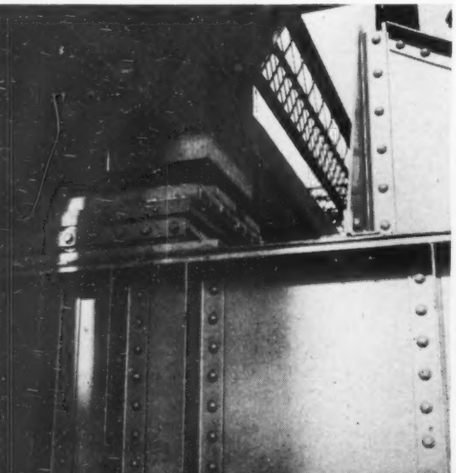
Collins Brothers of Mechanicville were the low bidders at $72,486, and they signed the contract on July 12, 1943. The problem now was to get the two trusses established on a suitable pier as quickly as possible. Plans were made to carry out the following procedure:

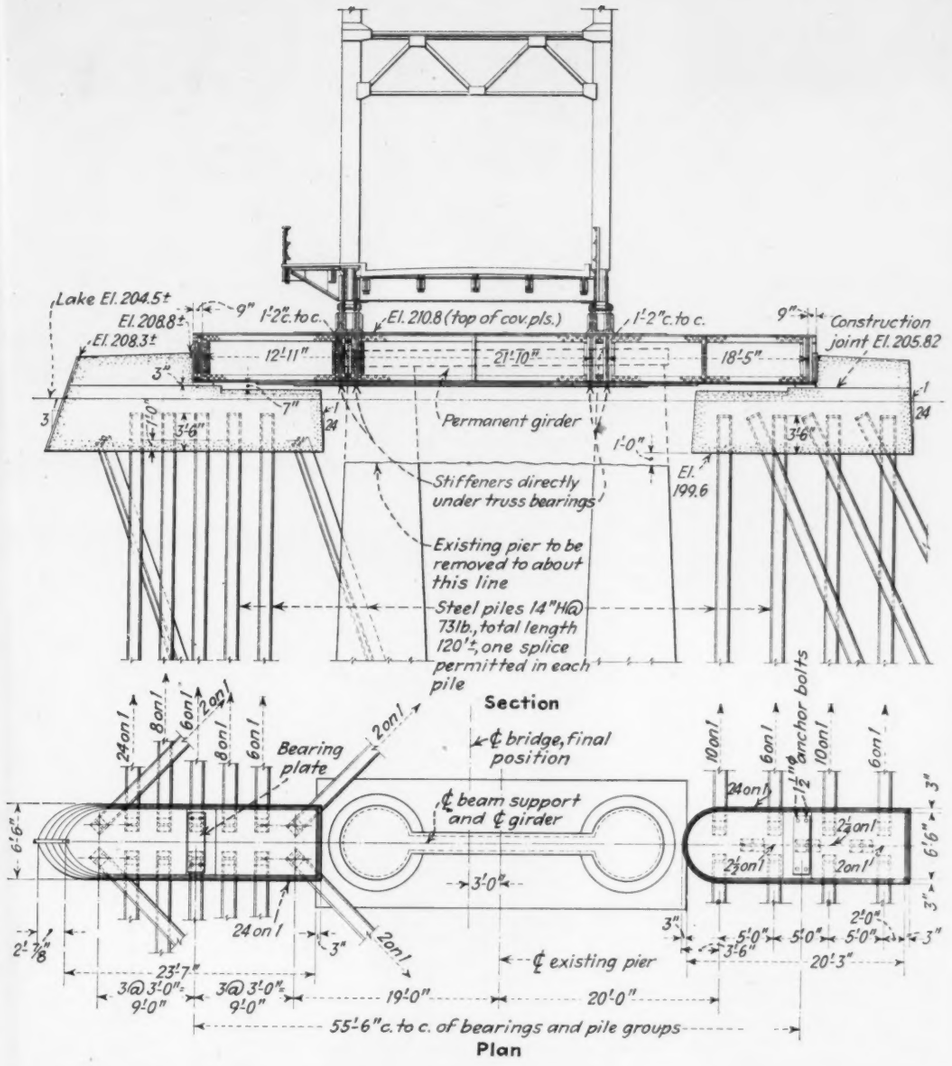
(1) Erect 12-ft. timber runways on pile bents along both sides of the bridge from the north shore out past the north pier to a point just beyond the second panel point of the center span.

(2) Drive 12-in. pipe-pile groups at the second panel point from the pier of both spans, as near to the trusses as possible. Cap the pipe piles and place built-up

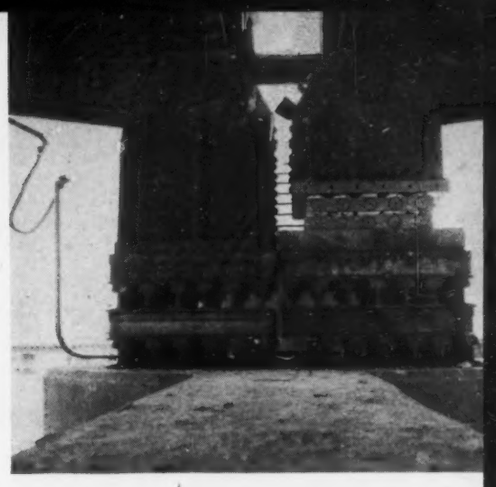
TWO-WAY ROLLER NEST on temporary lifting girder (below) enables bridge crew to re-align bridge in original location. Note jacking buck on girder to permit insertion of jack for moving span sidewise to designed position.

PERMANENT GIRDER (below) is installed on pile-supported concrete caps at pier location while two spans are carried on temporary lifting girders, and load later is transferred from these temporary girders to permanent girder. Old pier cap has been removed down to ice surface to make way for permanent girder, here shown in place.

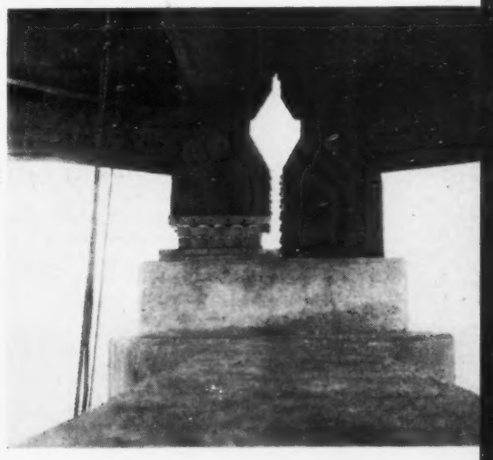




TO REPLACE FAILING PIER which has moved transversely and settled, New York State Department of Public Works lets contract calling for driving 120-ft. steel H-piles in groups at two ends of existing pier, capping these pile groups with concrete, and placing permanent cross girder on caps to carry load of two bridge spans resting on pier at this location.



AFTER TWO SPANS have been transferred to permanent girder at new north pier, center span and south span are jacked up on south pier to improve bridge profile, and south pier bearings are established on rail grillages (above), later encased in concrete as shown below.



steel box girders under the trusses.

(3) Jack the girders and trusses up into proper position from the pipe-pile caps.

(4) Slide the trusses back into correct alignment, using transverse roller details and jack blocks provided on the girders.

(5) With the spans thus safely supported, drive groups of steel H-piles about 120 ft. long, battered as shown in an accompanying drawing, just off the ends of the old pier. Place concrete caps over the H-piles.

(6) Remove the old pier down to a line about 5 ft. below the water line, and move the permanent box girder into place.

(7) Establish truss bearings in position on permanent girder.

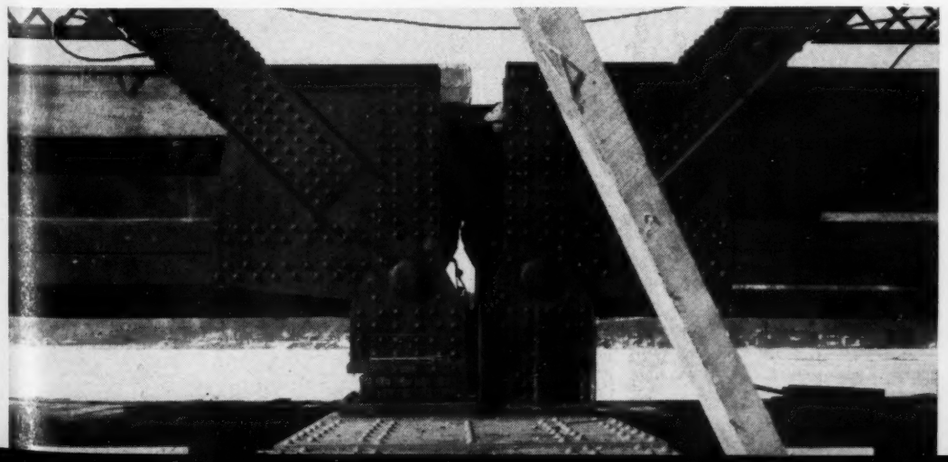
(8) Remove lifting girders, withdraw pipe piles, dismantle runways, restore bridge details, and re-establish north embankment.

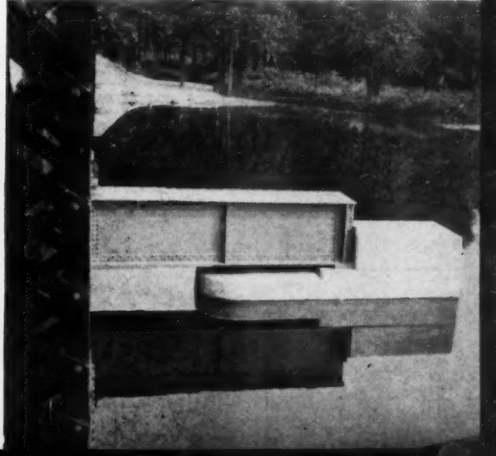
Operations were hampered by all sorts of difficulties. It was difficult to obtain satisfactory piles and timber. The timber contractor was attempting to operate a 30-man enterprise with a dozen men. Timber sources were of necessity catch-

(Continued on page 162)

DOWNSTREAM END of new pier (below) has rounded nose, as distinguished from sharper ice-breaking nose of upstream end.

BEARINGS ARE ESTABLISHED for two spans on permanent girder of new north pier (below).





HOW They Did It

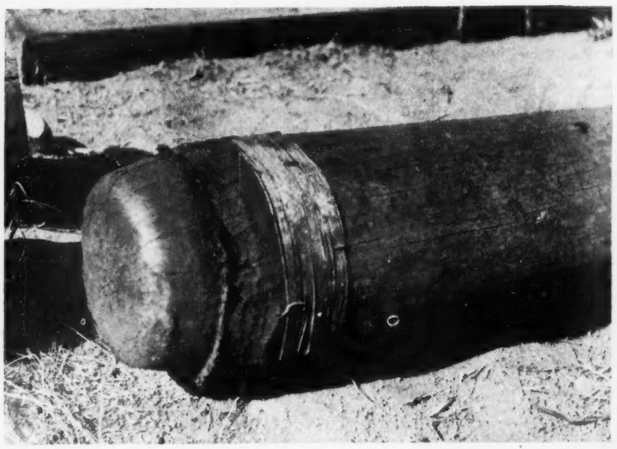
CONSTRUCTION DETAILS For Superintendents and Foremen

BEND IN PIPELINE SECTION is made by jack mounted on T-shaped tubular stand with welded saddle base which fits over pipe. Jack reacts against wire rope tied to pipeline. Work is being done on new gasoline supply line under construction by Chinese coolies and American soldiers in China.

POWER FOR FLOODLIGHTS and tools to aid in repair work on railroad trestle is provided by portable gasoline engine-driven Homelite generator (below) which has ¼-in. resilient seal made from Hycar gasoline-resistant rubber in carburetor needle valve adjustment. Man in foreground is operating Stanley saw.

3-IN. BAND of No. 12 annealed iron wire wrapped 12 in. below pile butt and fastened in place with 1½-in. fence staples by Atchison, Topeka & Santa Fe Ry. Co. protects treated wood pile ends under hammer blows, especially where hard driving is encountered. Wrapping is done at treating plant after seasoning and immediately before treating to obviate possibility of wire becoming loose.

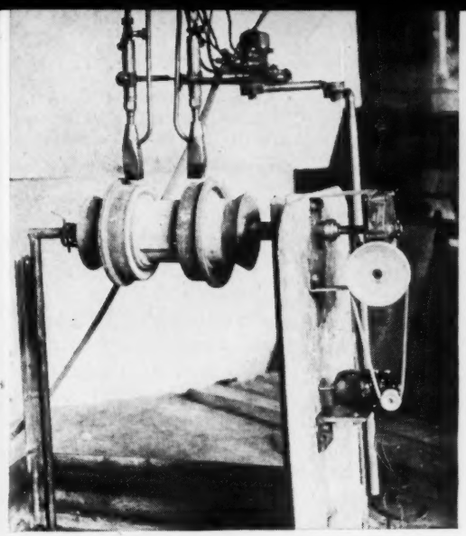
Wood Preserving News Photo



REMODELLED FUEL TANKER transports bulk cement at Anderson Ranch Dam in southwestern Idaho for Morrison-Shea-Twaits-Winston Co., contractors. Cement screws operated by electric motor at front of tank unload cement into roadway hopper from which it is blown into silo at mixing plant. Electricity for motor is supplied to short cable stub, projecting at front of tank, from standard power outlet adjacent to unloading hopper. Tank capacity is 40,000 lb., but road conditions limit each load to 24,000 to 30,000 lb.

Page 102

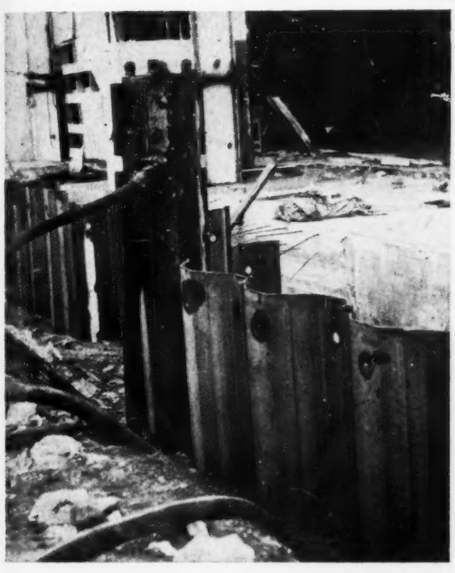
SAFETY DEVICE (below) prevents lock ring from flying off when filling scraper tires with air at LaPlant-Choate plant. Steel strip, welded to cup which fits over hub of wheel, is fastened to wheel with three bolts and extends over lock ring or tire rim.



FLAME-HARDENING of pair of single-flange tractor rollers is accomplished by homemade motor-driven rig. Rollers are mounted between conical centers on jig and rotated by small electric motor through reduction gear. Specially made 13-flame heads are attached to two standard welding blowpipes so that both rollers can be hardened simultaneously.

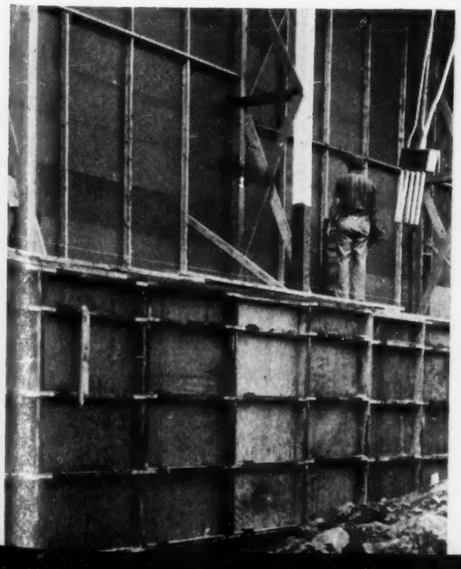
Linde Air Products Co. Photo

IN RIVER DRIVE OF RAILROAD TIES down 100-mi. length of Wind River between Dubois and Riverton, Wyo., Wyoming Tie & Timber Co. makes effective use of HD10 Allis-Chalmers tractor-bulldozer for pushing ties into stream and breaking up minor log jams in shallow water. Ties of lodgepole pine cut in Shoshone National Forest are stacked for ¼ mi. along bank, three tiers deep and 20 ties high, for delivery to Chicago & Northwestern Ry.



WALL OF ARCH-WEB STEEL SHEETPILES 12 ft. long is driven around each group of concrete footings to protect them against settlement when pits for presses are excavated in press shop addition constructed by Darin & Armstrong at Buick plant, Flint, Mich. ("Construction Methods," September 1945, p. 84.) Slotted guideplates cut from sheetpiles and bolted to McKiernan-Terry No. 6 hammer help in setting and holding hammer on piles.

SIDE-MOUNTED TRACTOR BOOM made of scrap pieces of wrecked Japanese pipe and steel is used by Seabees to lay 15-mi. pipeline on Pacific island. Device, mounted on Allis-Chalmers HD-7 tractor, uses power from its Gar Wood takeoff to activate boom and load lines. Machine is stable under 2½-ton loads with boom at 45-deg. angle. Rig will lift 4 tons on high boom.



PLYWOOD FORMS in prefabricated panel (left), connected longitudinally by metal straps and transversely by wire ties between clamps on horizontal studs, serve concrete wall construction by Thorgersen & Ericksen at Buick plant in Flint, Mich. ("Construction Methods" for September 1945.) Temporary curtain of wallboard on wood framing, above concrete wall, separates area where machines are being handled from section under construction.

DIPPER TEETH and latch bars (above) are hardfaced with Haynes Stellite alloy to increase endura →

PAINT SCRAPER (right) with narrow handle and wide scraping surface is used to clean steel surfaces at Marinship Corp. yards, Sausalito, Calif. Chipping pick is at

On-the-Job TRAINING

Speeds Completion of Atomic Bomb Project by 45,000 Workers

By JOHN F. SEMBOWER

Training and Relations Supervisor,
Hanford (Wash.) Engineer Works,
Construction Division, Engineering Department,
E. I. du Pont de Nemours & Co.

CONSTRUCTION CAMP at Hanford Engineer Works in State of Washington, where more than 45,000 workers live while job is at its peak.

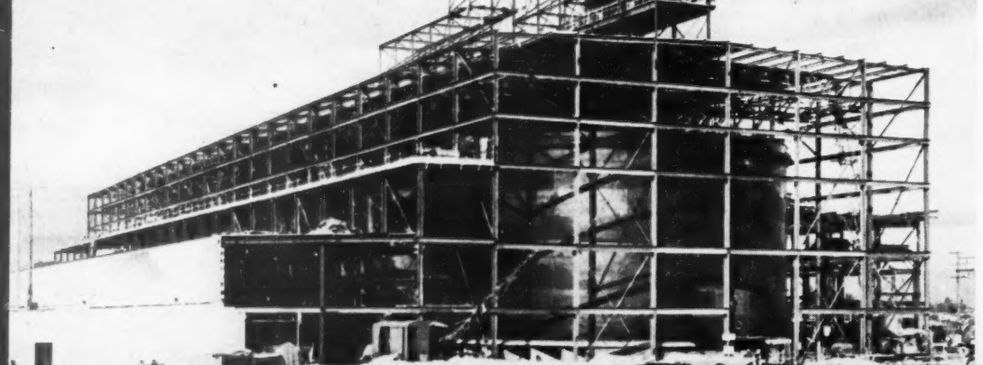
ALL-OUT CONSTRUCTION EFFORT met the accelerated building schedule for the mammoth Hanford Engineer Works, sprawling over 430,000 acres in southeastern Washington and constituting a vital link in production of the atomic bomb. With such a high premium placed on the ingenuity of the construction industry, the unfolding of the full story of the building of the plant will reveal many new developments. A major feature of that part of the story which now can be told discloses how brainpower as well as manpower was fully mobilized.

The Hanford job broke many construction records for size and speed. It cost more than the Panama Canal, involved the movement of 25,000,000 cu. yd. of earth, required 780,000 cu. yd. of concrete, used 8,653 major pieces of equipment and employed a peak work force of 45,000 workers. The project was completed in less than two years and was the scene of the most extensive and ambitious use of training that the construction industry yet has seen.

Training Given Thorough Trial

Before actual construction started, it was decided that industrial training, which had worked wonders in war production generally but had missed fire in a number of construction situations, would be given a thorough-going trial. So almost everyone at Hanford "went to school" again. More than 3,000 foremen had thorough training in foremanship. They, in turn, conducted many types of training for their crews. There was extensive training both on the job and off

WELDING is particularly important in building this (below) and other structures, details of which have not been released. More than 300 welders were given 12-hr. training and 202 were immediately able to qualify by passing exacting field tests.



CARPENTER CRAFTSMAN (below) like almost everyone at Hanford, "goes back to school" to learn work improvement methods.

RIGHT AND WRONG METHODS are illustrated, as in the example of these two saw-horses.

MODEL OF CONCRETE FORM CONSTRUCTION aids worker in setting up similar units on job to meet specifications.

the job, the latter on the workers' own time and at their own volition.

Topmost supervision had its own training shot-in-the-arm through a specially designed course for the superintendents. Thousands of office girls received clerical and stenographic training. When comptometer operators were urgently needed, they were trained at their machines, and in a month were performing work which formerly would have been considered an accomplishment after six months training. Cooks in the commissaries were trained in the food preparation formulas of the Army and Navy. Engineers and professional men took college-level courses conducted by faculty members of nearby universities and colleges.

If there was any single characteristic of all this training, it was the complete absence of academic atmosphere. Training was where you found it at Hanford. It had no classroom associations. The "classroom" might be a special lot where carpenters could study and practice on the types of scaffolding in use or the particular concrete forms, in a boiler room, the rear end of a millwright shop, a rigger loft or a quiet office set aside for training of clerical personnel.

Careful Study of Problem

Casual as the training process might seem to the outsider looking on—and this relaxed informality was a real secret of success of the entire program—none of the training really was haphazard. It was the end-product of some of the most carefully calculated training approaches ever made in an American industry.

The first step had been to analyze the deficiencies of ordinary industrial training when used in the construction industry. Second, the goal was set that training at Hanford would be stripped down to its most practical essentials, and training would be made into a tool which could be rolled quickly into place and its effect brought to bear on any problem, however small or elaborate and complex. Third, there would be progressive evaluation of the training, and some of the most thorough follow-up that had been used up to that time in any training experience.

Construction Requires Special Program

It was recognized at the outset that there are fundamental training differences between construction and the production industries with the latter's characteristically repetitious operations. Either a construction training program must be simple enough to be focused on a small job which may never be repeated, or it must be basic enough to apply fundamentally to many jobs which differ on the surface.

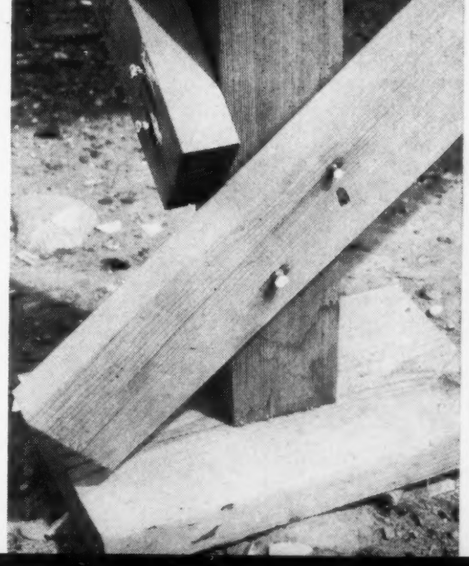
It was also recognized that the construction industry needed its own specially designed training materials. A construction worker was not impressed by a sample job taken from a production line. The Training Within Industry Service was persuaded to permit special adaptations of its job instructor, job relations and job methods training formulas so that construction examples would be used. Small training handbooks, vest pocket size, were specially designed for each of the crafts. They contained the basic specifications of the job.

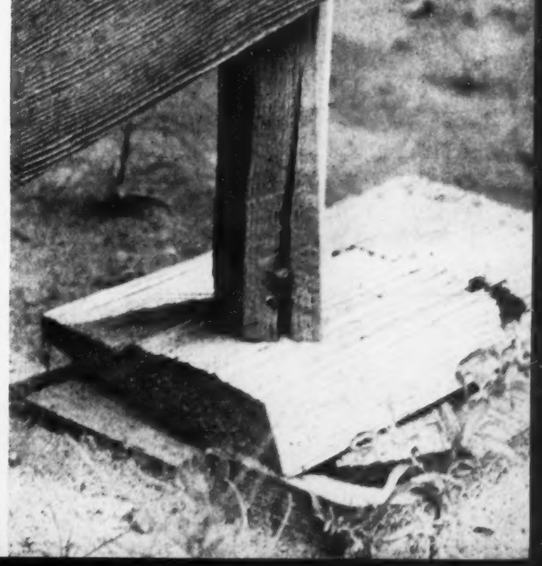
Three Types of Training

All training was divided into three great categories: (1) leadership training; (2) job training, and (3) methods training. Every training assignment was carefully analyzed in advance. The goals were established, the "know how" broken down and organized into easy "takes" for the learners, the plan of follow-up determined upon, and the methods of evaluation chosen in advance.

Leadership training encompassed many of the project-wide programs. It included both job instructor training and

SPECIFIC EXAMPLES (below) of good and bad footings for scaffolding teach workers lessons in safe construction on Hanford job.





SAFETY IS STRESSED in this demonstration of how scaffolding should be built to meet job requirements.

"CLASSROOM" FOR AUTOMOTIVE MECHANICS never lacks vehicles on which repairs and adjustments need to be made as part of training course.

job relations training under the training within industry program, as well as general orientation training for each worker and foreman induction training in each craft. The personal efficiency training for top supervision was classed as leadership training.

Job Training Meets Specific Needs

The broadest category of all was job training. Its accomplishments were the most spectacular and its developments the most original and revolutionary. Job training precipitated the training organization into almost every conceivable situation. A supervisor with any problem involving the human element was expected to call in the trainers. This was an edict from top management, but it was never necessary to enforce it as such. Early in the job the training staff appeared before meetings of superintendents and supervisors to do one of the most crucial items of job training—train supervision in how to use training itself.

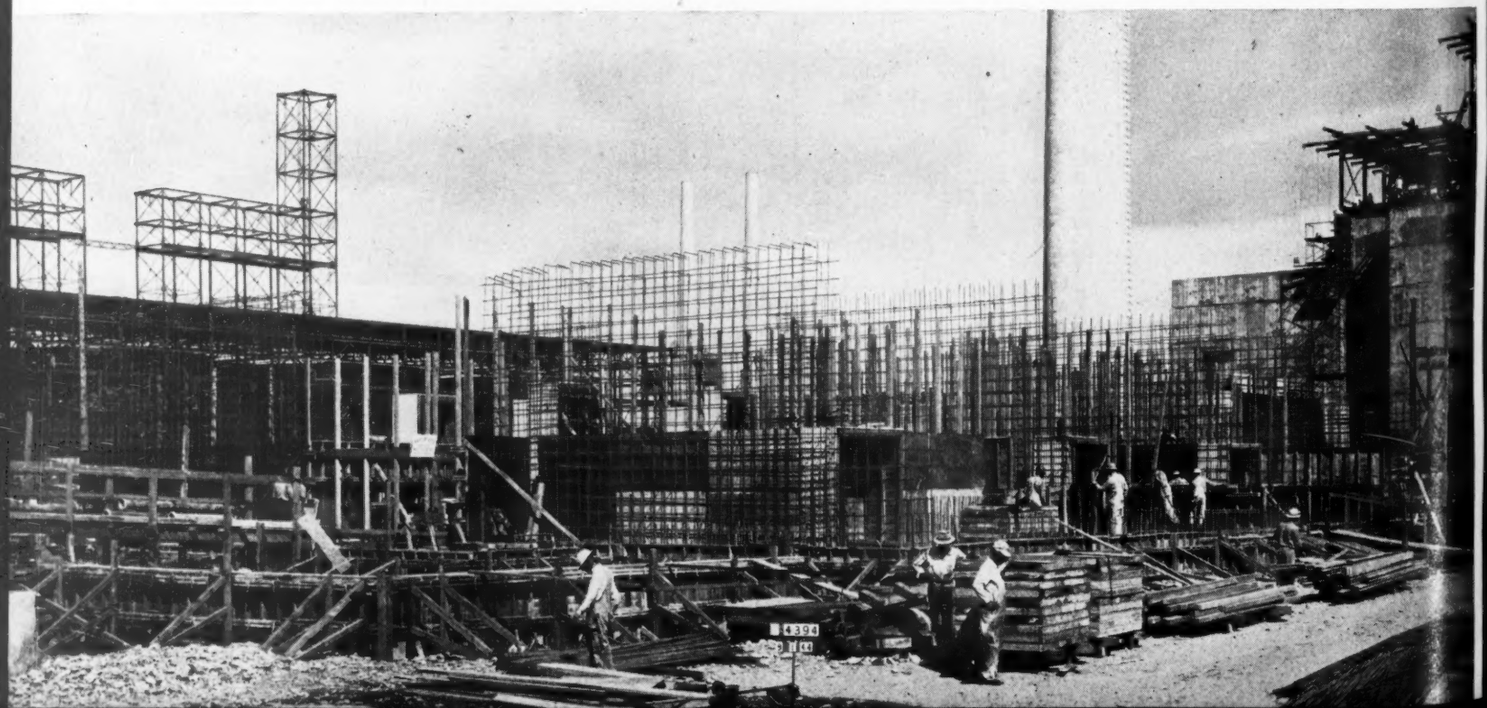
How Job Trainer Works

15-min. explanation of job training was presented to scores of meetings. The supervisors were told what would happen if they called in a trainer to tackle a problem. He would not ensnarl them in a mass of paperwork, make demands for impossible equipment and surroundings, and generally make himself more a nuisance than a help. Instead, he would quickly diagnose the problem, using a simple analysis sheet on which he would list the apparent requirements of the job in a vertical column on the left, and the possible solutions to the problem in a horizontal column across the top, cross-checking the problems and their applicable solutions.

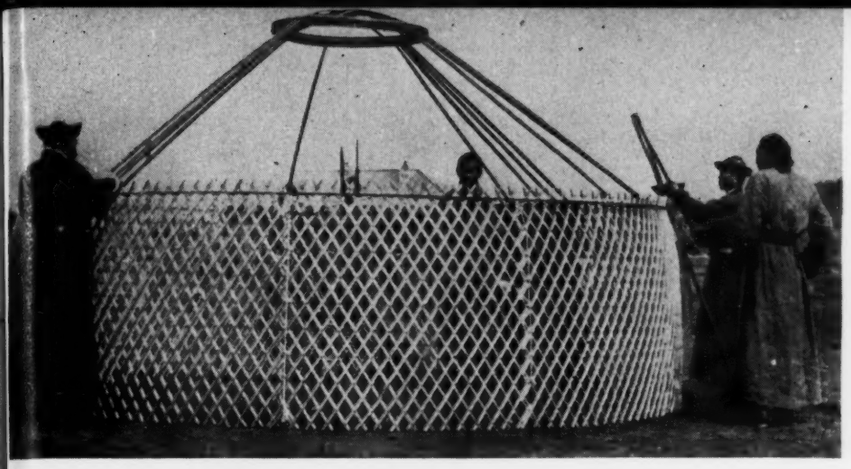
Next he would make definite recommendations for action, specifying the "how," "when" and "where" of the training, and suggesting "who" should do it.

(Continued on page 146)

PLACING OF STEEL REINFORCEMENT (below) amounting to 20,000 tons for 784,000 cu. yd. of concrete, is a major field operation. Special training given to all men engaged in this work effects large savings.

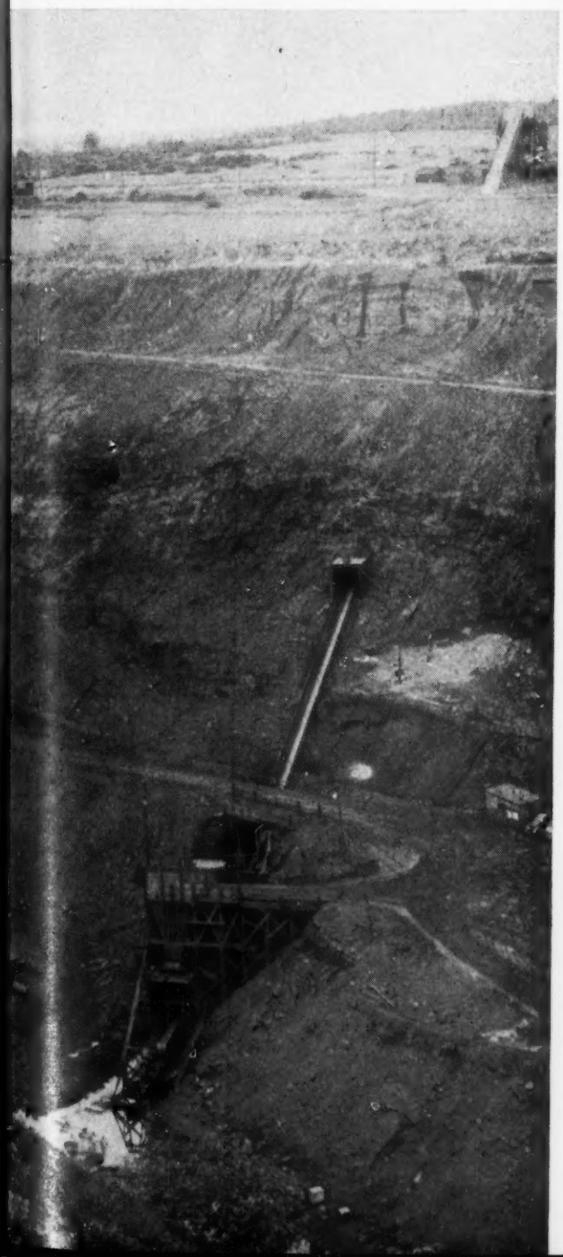


JOB oddities



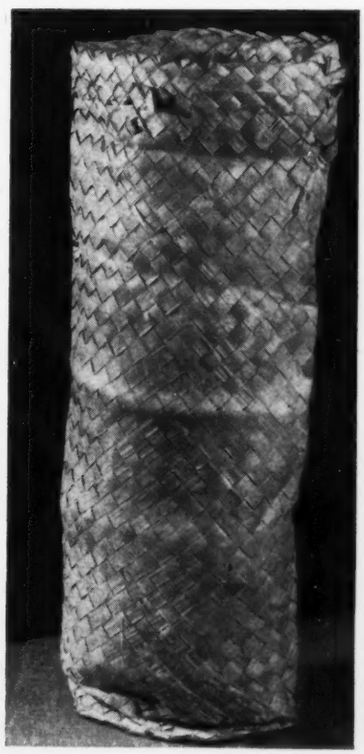
COLLAPSIBLE TRELLISWORK TENT is erected by nomadic Buryat tribe in far-eastern Russia. Roof is made of rods, with hole in top for light and air. Entire structure will be covered with sheets of felt and tied together like parcel. Authenticated News Photo

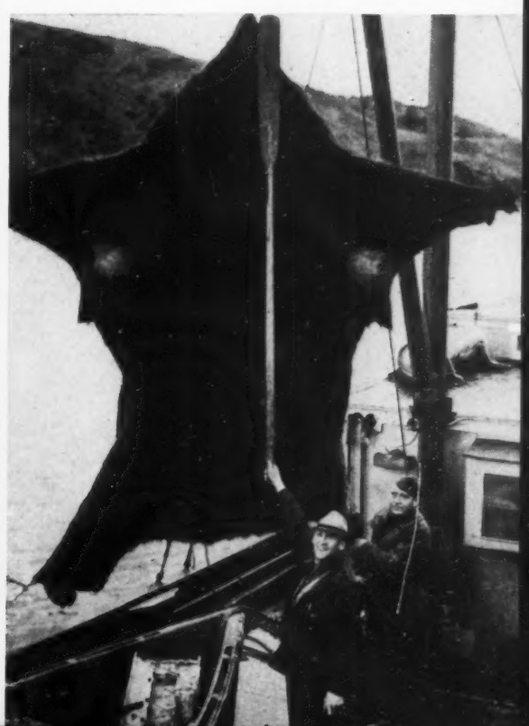
GREATEST VERTICAL LIFT of any single conveyor belt in world is claimed for this belt (below) in Mesabi mountain pit of Charleston Iron Mining Co. in northern Minnesota. Total lift is 272 ft. and length is 1,900 ft., with center-to-center distance of 947 ft. Supplanting three-belt system, it handled 1,250,000 long tons in first year of operation. Belt is 30-in. eight-ply synthetic cord construction type made by B. F. Goodrich Co.

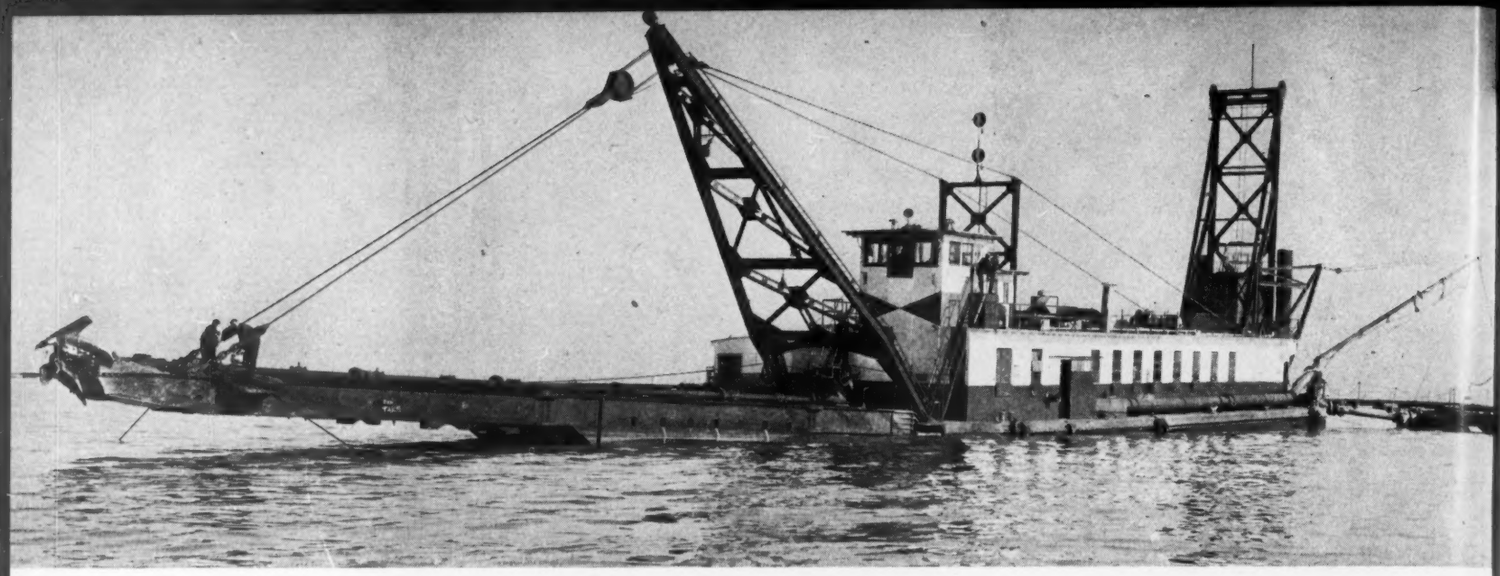


ERSATZ CEMENT SACK (below) is one of 250 nipa fiber bags captured from Japs during Leyte campaign by American cavalry outfit. It is approximately 13 in. in diameter and 28 in. tall.—From Lieut. Col. James F. Kerr, U. S. Army.

HUGE BEAR'S HIDE (below), measuring 10x11 7 in., is evidence of big-game hunting prowess construction crew of Siems-Drake-Puget Sound C during building of Navy air base on Kodiak Islan Alaska. Weighing 1,600 lb., big bear (above) w shot Oct. 26, 1941 on Afognak Island, just northea of Kodiak, where tractors, one of which is se alongside bear's body, were at work grading a field site. Photos, withheld until now for reaso of military security, were supplied by Rudy J. Ho of Johnson, Drake & Piper, Inc.



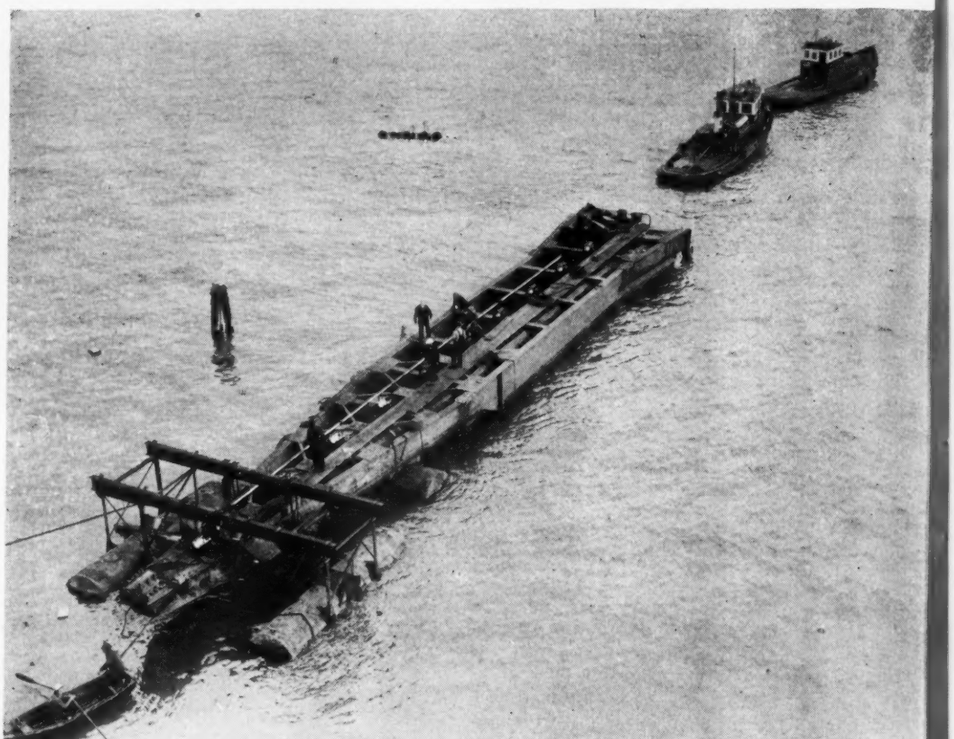




CREW SERVICES CUTTER SHAFT BEARINGS of dredge ladder in raised position. Discharge pipe, 20-in. size, leads astern on deck of dredge and on to pontoons, outfall being into water at considerable distance away. Boom at stern of dredge carries submarine power cable from reel barge.

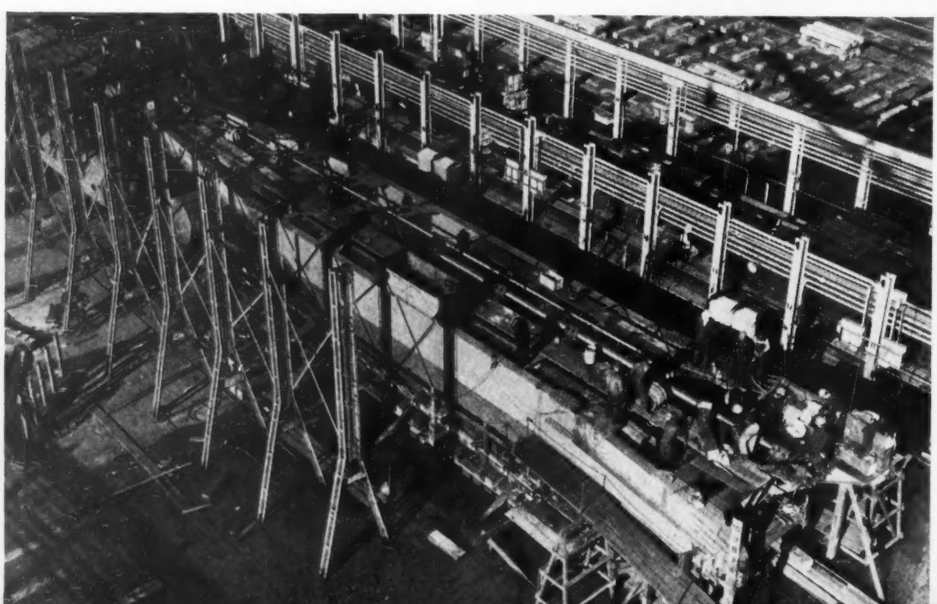
Modified Suction Dredge

OPERATES AT RECORD DEPTH



BUILT-IN BUOYANCY TANKS in extension section and temporary tanks at cutter end keep ladder on even keel as it is towed from shipways after launching.

DIGGING LADDER (below) of dredge "Papoose" is ready for launching after adding 50-ft. section to give new overall length of 125 ft. Ladder hull is launched 51 days after entering San Francisco shipyard of Bethlehem Steel Co.



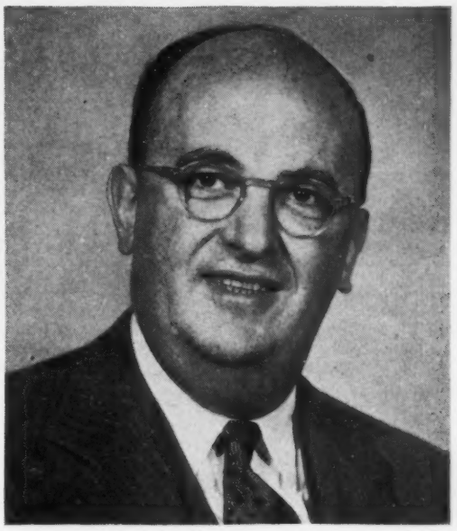
ADDITION OF A TEMPORARY 50-ft. built-up section to the 75-ft. ladder of a suction dredge owned by the Hydraulic Dredging Co. of Oakland, Calif. permits operations at the unusual depth of 100 ft. The new section, including five buoyancy tanks built into the ladder to provide additional lift, can be easily removed to reconvert the dredge to its original digging depth.

Modification work was done on a shipbuilding slip at the San Francisco Shipyard of the Bethlehem Steel Co. Here, the dredge ladder hull was placed on greased skids, cut in two and pulled

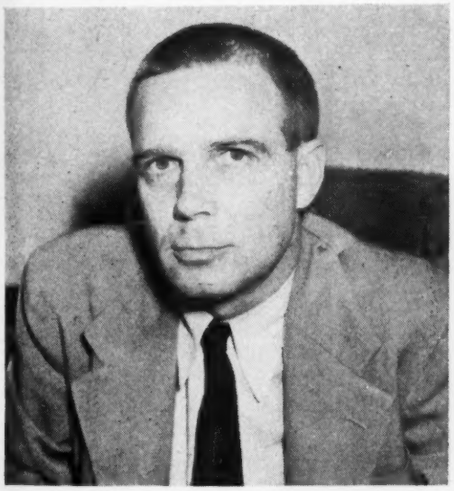
(Continued on page 168)

Present and Accounted For...A PAGE OF PERSONALITIES

REVIEWING TROOPS at Fort Belvoir are GENERAL BREHON SOMERVELL (left), Commanding General, Army Service Forces, and MAJ. GEN. FRANCIS B. WILBY. Recently assigned commanding general of Fort Belvoir, General Wilby is in charge of Engineer School and Army Service Forces Training Center.



PUBLIC RELATIONS PROGRAM has been inaugurated by American Society of Civil Engineers to familiarize public with civil engineers and their work. Program will be conducted by ALLEN WAGNER, public relations assistant to Col. William N. Carey, Society secretary and executive officer. Mr. Wagner formerly served as public relations director of Minnesota Mining & Mfg. Co., of St. Paul.



NEW DIRECTOR of Region II, U. S. Bureau of Reclamation, RICHARD L. BOKE moves up from post of supervisor of operation and maintenance. Region embraces Central Valley Project, northern California, and part of Oregon, with headquarters at Sacramento.

NAMED DEPUTY COMMISSIONER for design and construction of U. S. Public Buildings Administration is JESSE E. STANTON, formerly PBA division engineer in San Francisco. Before joining this agency in 1941, Mr. Stanton had been associated with D. H. Burnham & Co. in Chicago and Warren & Wetmore of New York.

NEW CHIEF of U. S. Navy Bureau of Yards and Docks is REAR ADMIRAL JOHN J. MANNING, who has been serving since June as director of Bureau's Eastern Pacific Division, with headquarters at San Francisco.

ELECTED PRESIDENT of American Welding Society at annual meeting is WENDELL F. HESS (left), professor of metallurgical engineering and head of welding laboratory at Rensselaer Polytechnic Institute, Troy, N. Y. Recipient of 1945 award of Lincoln Gold Medal and Certificate is LEON C. BIBBER (right), welding engineer for Carnegie-Illinois Steel Corp.

CONTROLLED ATOMS or CONTROLLED LIVES

SINCE August 6th when the first atomic bomb was released over Hiroshima, the American people have been subjected to a continuous barrage of pronouncements on the use and control of atomic energy. Some of this comment has been strident, and much of it conflicting. A considerable portion of it has been of sincere and constructive excellence.

It has not been easy to separate the wise counsel from the merely noisy, and it is small wonder that the minds of many are troubled and confused.

However, the sheer mass of discussion poured into press and microphone has awakened us all to the gravity of the issue. In terms of any problem on which Americans ever have been called to exercise a judgment—This is It!

Even the dullest now recognizes that atomic weapons hang over modern civilization like the Sword of Damocles, and understands in some measure how fragile and taut is the hair of political balance that holds it suspended.

From this point on, we need the coolest and most carefully considered judgment that can be brought to bear. Discussion highly charged with emotionalism will but increase the tensions both at home and abroad, and render wholly insoluble a delicately intricate problem.

What Is The Problem?

The major outlines of that problem now are coming into focus in understandable terms:

1. The scientists have opened up a new and virtually unlimited storehouse of energy, and the engineers have discovered how to turn it into a military explosive incomparably more powerful than any we have known. We know that this energy may also be used to produce heat for useful power, and we suspect that the radioactive substances produced by the process in hitherto unimagined quantity may also have medical, industrial, and other constructive applications.

2. Terrifying as have been the demonstrations of the atomic bomb thus far, we know that they are as nothing in comparison with its potential destructiveness. The explosive force of individual bombs can be increased tremendously, and means for their effective delivery to predetermined targets in wholesale quantity already are at hand. The experts tell us that no practicable means of interception can be devised, and that reprisal in kind probably will be the only answer to an enemy attack with atomic weapons.

3. So far as we can see now, even successful retaliation would be at best an answer of hollow effect. Any two nations each having wholesale stock-piles of bombs could accomplish the practical destruction of each other. Since a first treacherous blow might well constitute an enormous advantage, a nation actuated by a ruthless urge to conquest or revenge might have the best chance of survival. But since the widest possible dispersal of bombs and launching units would be dictated by the strategy of atomic weapons, it is doubtful that one nation could destroy another without itself suffering destruction. On both sides the major centers of population could be wiped out, and the nation of least concentrated industrialization and commerce would suffer least. However, no one can be sure that the concentrated explosion of as many as 20 thousand atomic bombs would not poison the atmosphere of the world to an extent that would be fatal to great masses of population, not only within the country bombarded, but perhaps in the country which launched them.

4. The problem is further complicated because, so far as we know now, any large-scale commercial use of atomic energy as a power source is more or less inextricably linked to a potential military use. It is true that, if atomic power becomes economically feasible (which is by no means certain for a long time to come), it would require only low-grade concentrates of fissionable material, which would need further elaborate and costly processing before reaching explosive potential. But the process of producing such low-grade concentrates constitutes perhaps two-thirds of the industrial effort required to make effective bombs. It follows, then, that if nations were to equip themselves to produce large quantities of low-grade concentrates for power generation, the effort required to develop large-scale bomb production would be materially reduced. Moreover, the maintenance of an effective inspection to police agreements not to produce bombs might be forbiddingly difficult if atomic power generation were allowed.

5. In addition to the major problem posed by the use of atomic bombs in international war, any nation which produces or possesses such bombs, or the fissionable materials with which they are loaded, faces still another in the danger of their falling under the control of paranoid elements in its own population.

What Are We Going To Do About It?

We face the hard fact that we have produced a weapon capable of destroying whole nations—perhaps even the whole world. Although we were importantly aided in its development by the nationals of other countries, we, together with Great Britain and Canada, now must take the initiative in deciding what shall be done with it. We have only two choices. We can try to keep this weapon as a monopoly of our own, or we can try to place it under broad international control.

Can We Keep It To Ourselves?

If we know one certain fact about the atomic bomb, it is that it cannot long be held as a monopoly of those nations which produced it.

If Nazi Germany had succeeded in developing the weapon first, it probably would have attempted to achieve world dominion, with utter destruction as an alternative. Such a course is not within our range of choice. It violates every principle for which we stand.

Much reckless nonsense has been uttered concerning the inability of other nations to master the scientific, engineering, and industrial problems involved. It is the virtually unanimous opinion of those who worked on the project that several nations today are fully equipped in science, engineering, and industrial organization to produce atomic bombs and to provide the means for launching them. At least one of these nations, Russia, has also access to an ample supply of the necessary raw materials. The only debate is over whether it would take three, or five, or ten years for her to marshal her resources to produce bombs in multiple thousands. Once such an atomic race were on, we have no reason to believe that Russia might not divert more resources to the task than we ourselves should be willing to put into it.

Additional nonsense is talked as to how we might attempt to cope with the problem of living in a world in which mutually suspicious or hostile nations faced each other, with stores of atomic weapons on both sides. We hear talk of dispersing our cities and even of moving underground. No one has seriously reckoned the difficulty or the cost of following such counsel of despair. Still less has anyone appraised the neurotic effect upon men's minds of living by any such preposterous formula, under continuously mounting tension day after day, and year after year.

Certainly, if we could find no way to prevent the competitive production of atomic weapons, we should be driven at least to the selective dispersion of our bomb-launching facilities, of certain key industrial establishments, and of our centers of government and governing personnel. We should be forced, also, to change our traditional requirement that only Congress can commit us to active war. We should be forced to organize ourselves as a police or military state, with our scientists regimented and muzzled, with all of us under constant surveillance against the smuggling and planting of time-bombs, and constantly alerted against attack through the air.

Before we commit ourselves to any such intolerable procedure, we should be mad not to explore all possible means for making it unnecessary.

The Only Feasible Alternative Is Effective International Control

This cardinal principle has been recognized in the statement of November 15th, issued jointly by President Truman, and Prime Ministers Attlee and King. Their statement frankly concedes that against atomic weapons there can be no adequate military defense, that no nation can command a monopoly of such weapons, that responsibility for eliminating atomic energy as an instrument of war and for devising safeguards over its use for the advancement of science and other peaceful and humanitarian ends rests upon the civilized nations of the world.

They propose that a commission be set up at once under the United Nations Organization to make recommendations: (a) for extending between all nations the exchange of basic scientific information for peaceful ends, (b) for control of atomic energy to the extent necessary to ensure its use only for peaceful purposes, (c) for the elimination from national armaments of atomic weapons and of all other major weapons adaptable to mass destruction, and (d) for effective safeguards by way of inspection and other means to protect complying states against the hazards of violations and evasions.

Already criticism is leveled at the wording of the statement, at alleged omissions, at the wisdom of choosing the United Nations Organization as the medium through which to seek agreement in view of the weaknesses of the UNO Charter.

None of these issues should be crucially important. What matters is that an invitation has been issued in good faith for the nations of the world to meet and decide upon means for assuring the elimination of weapons, the existence of which no one can afford to tolerate.

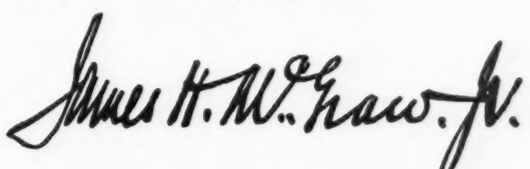
The decision cannot be other than international; it will require the best thought of the best brains the world can muster. The smaller nations have an equal stake with the large, and from them may well come the most fruitful suggestions. But Russia now holds the key to the success or failure of our proposal. If she accepts our invitation, no other nation will refuse.

Alternatively, there will be an international armament race paced by atomic weapons. It will mean an end of free science, a severe policing and regimentation of international travel and trade, and innumerable restrictions upon those individual freedoms which we have just fought so desperately to preserve. This is the dismal prospect if we fail to arrive at a genuinely international accord on the control of atomic energy. But even this interval would promise to last only for an uneasy period, until someone started pressing the push-buttons on the panel-boards of extinction.

The only permanent solution lies in finding means to eliminate war itself. That we cannot hope to achieve overnight, but we can, and do hope that the nations will now agree to eliminate atomic weapons and their radioactive by-products as instruments of war.

If they do that, we can move forward more surely to the constructive development of the incalculably valuable resources that science has newly opened to our use. And, we can hope also for a progressive improvement in international understanding.

Unless the nations can reach agreement on this paramount issue of atomic energy, it is difficult to conceive of any vital issue on which they might agree.



President, McGraw-Hill Publishing Co., Inc.

THIS IS THE 42ND OF A SERIES

U. S. Engineer Board Develops

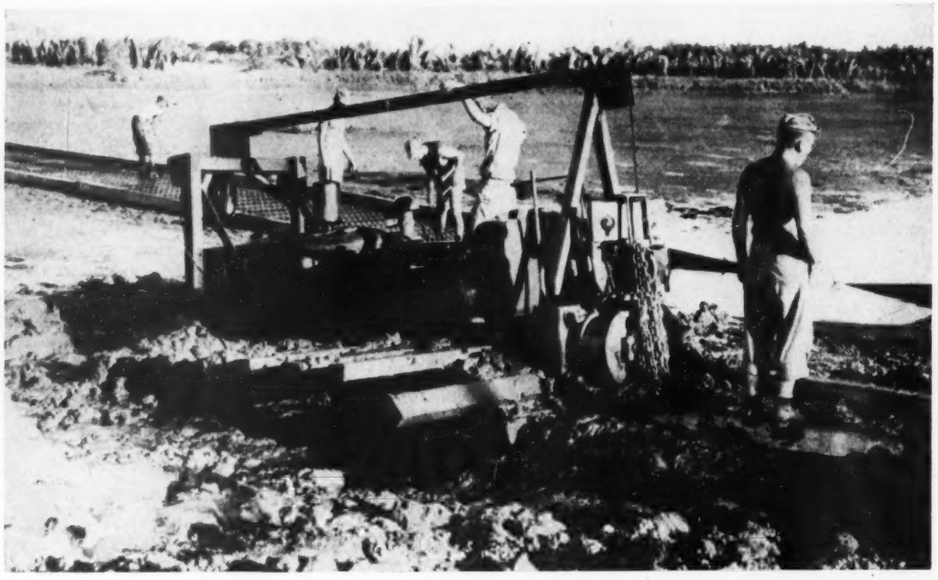
Wide Tracks for Tractors

GROUND CONTACT AREA OF 10,275 SQ. IN. is provided by 4x6x60-in. wood extensions bolted to each plate of D6 tracks, reducing ground pressure to 2.38 psi. Later development, 32-in.-wide continuous track, has about same amount of ground contact area but provides improved balance.

WIDENING OF TRACKS to increase ground contact area enables tractors to operate over highly unstable soils, according to test results of the U. S. Army Engineers. Designed for use over soft rice paddies of Japan, a tractor so modified is capable of towing a 105-mm. sled-mounted howitzer over otherwise prohibitive terrain. The same principle may be applied to construction equipment in marshy areas.

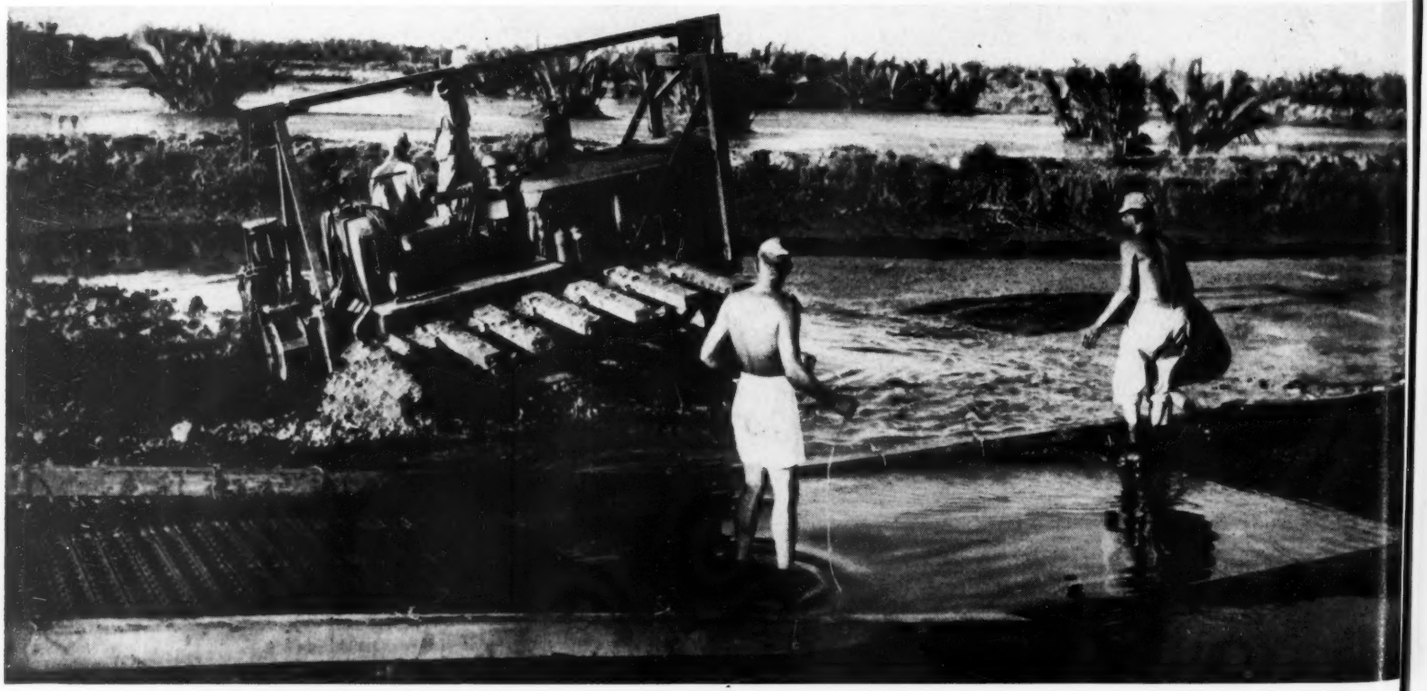
Steel and Wood Considered—In initial experiments by the Engineer Board at Ft. Belvoir, Va., various types of steel and wood track extensions were studied. The latter met all requirements satisfactorily and were chosen for military use because they are lighter than steel extensions and can be manufactured and attached in the field.

Two Widths of Track Tested—On the basis of field tests, the use of wood extensions 4 in. thick, 6 in. wide and 60 in. long on a D6 tractor was approved by the Engineer Board. Tests of a tractor equipped with a continuous track 32 in. wide, as compared with the standard tread width of 22 in., are now being conducted. A tractor so equipped has about the same amount of ground contact area as one with 60-in. extensions, but improved balance enables it to pull much larger loads with less strain.

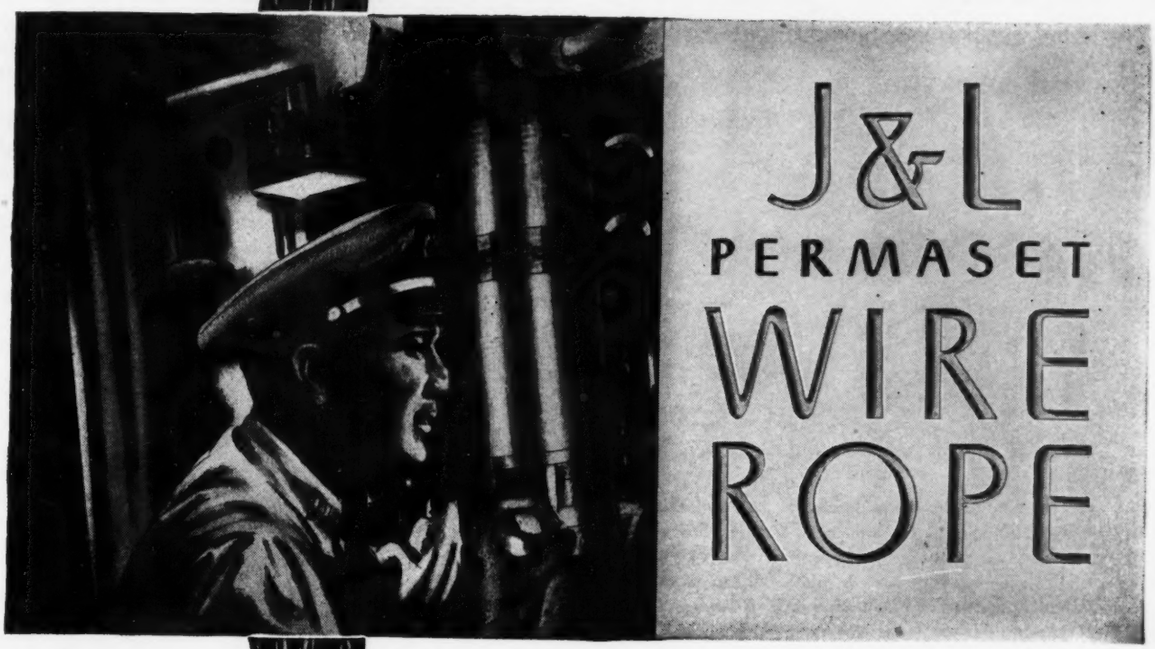


WOOD EXTENSIONS bolted to alternate track plates of Caterpillar DC-7 tractor provide sufficient ground contact area to permit equipment to travel through otherwise impassable quagmire in test by U. S. Army Engineers at Ft. Belvoir, Va.

TRACTOR EMERGES FROM SATURATED AREA (below) to relatively stable soil by means of 4x6x60-in. track extensions. In foreground "floating" roadway of interlocking pierced steel landing mat wired at 3- to 4-ft. intervals to timber curbs is being constructed by Army Engineers.



J&L PERMASET PRECISIONBILT PRE-FORMED WIRE ROPE



Precisionbilt to Protect Life • Equipment • Operations • Periscopes are built with precision. So is J&L Wire Rope. Safety of human life . . . protection of equipment . . . maintenance of operations . . . depend on the quality of the wire rope you use. To give you the greatest protection . . . J&L builds wire rope with precision . . . from J&L Controlled Quality Steel . . . by men of skill and experience . . . on machines of the latest design . . . and pre-forms it for greater efficiency and resistance to fatigue.

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

GILMORE WIRE ROPE DIVISION

PITTSBURGH 30, AND MUNCY, PENNSYLVANIA

J&L PERMASET PRECISIONBILT PRE-FORMED WIRE ROPE

LEGAL ADVENTURES of TRACTOR CONN

By LESLIE JOBB

No contractor ever tries to be his own dentist or his own shoemaker. It is even more dangerous for him to be his own lawyer. There are, however, some legal rules which every contractor should know, and these rules may be explained in plain English without resorting to the jargon of the law, unintelligible to most laymen.

This series of articles, dealing with the Legal Adventures of Tractor Conn, a typical contractor anywhere in the United States, explains some of these legal points in plain language for the contractor. Each one is based on an actual decision of an American Court.

The Case of the Disputed Strike

Tractor Conn agreed to erect a building for $17,000.

"The said Tractor Conn shall furnish a bond in the usual form from an approved surety company for the amount of the contract price, otherwise this contract shall be null and void," the building contract provided, and Conn furnished the required bond.

"The Surety Company shall not be liable for any damages resulting from so-called strikes or labor difficulties, or from mobs, riots, fire, the elements, earthquakes, cyclones, tornadoes, lightning or any act of God," one clause of the bond provided.

As soon as the bond was furnished, Conn began work. At that time he was a member in good standing of the Contractor's Association. The association had agreed with the different labor unions that the members of the association would employ only union labor and the labor union in turn, agreed that their members would not work for any contractor who was not a member of the association in good standing.

But there was a fly in the ointment. When the owner of the building decided to build, he had called for tenders and the members of the Contractor's Association bid. No bid was under $19,000, Conn's bid was more than the lowest tender, and the owner rejected all the bids. Then the owner made a private contract with Conn for $17,000. This was contrary to the rule of the association and Tractor Conn was suspended from membership.

A union committee called on Conn and asked if he had been dropped from the association. Conn admitted that he had.

"According to our agreement with the association, we can't work for you any longer," the committee told him. The union laborers stopped work, Conn was unable to get other workmen, union, non-union or otherwise, and could not complete his contract. The owner called for new bids, accepted the lowest tender of $19,000, and sued the Surety Company for $2,000, the difference between the original contract price and the price which the owner was now compelled to pay.

"That clause in our bond that the Company should not be liable for damages resulting from strikes or labor difficulties lets us out," the surety company contended.

"The difficulty is that this does not constitute a strike within the meaning of the bond," the owner retorted and the Washington Supreme Court ruled in his favor in a case reported in 188 Pac. Rep. 395.

"In our opinion these facts do not exonerate Tractor Conn from the obligation of his bond. In the common acception of the term, it is not a 'strike' for the workmen of an employer to quit his employment and go elsewhere, without intention of returning; nor is it a 'strike' for workmen to refuse to enter into the employment of a particular contractor," said the Court.

"Well, if it was not a 'strike' it was a 'labor difficulty,' " the surety company contended as a last resort but lost on this point as well.

"The addition of the phrase 'labor difficulties' to the term 'so-called strikes' does not enlarge the meaning of the latter. The phrase is but explanative of the meaning of the word 'strike,' and any act of the workmen which would not constitute a strike would not constitute a labor difficulty," was the reasoning of the Court on this phase of the case.

The Case of the Disputed Check

"Please ship the building supplies listed in the attached invoice, draw a draft and attach the bill of lading, to be delivered when the draft is paid," Tractor Conn wrote. The jobber shipped the supplies, drew a draft, marked it "deliver documents on payment," and delivered draft and bill of lading to his local bank.

The bank, without insisting on the payment of the draft, detached the bill of lading, delivered it to Tractor Conn, accepted his check drawn on a bank in another state and sent the check forward for collection. It came back marked "no funds."

Whereupon, the bank which had advanced the proceeds of the draft to the jobber, demanded that he reimburse the bank.

"You've no case against me, since you took a chance on accepting Conn's check without insisting on payment of the draft," the jobber contended and the Supreme Court of Washington ruled in his favor.

"Where a time draft attached to a shipper's order bill of lading is left with a bank for collection, the bank must hold the bill of lading until the draft is paid as security for payment of the draft as a cash transaction," said the Court, quoting from a decision of the United States Supreme Court in 91 U. S. 613.

More Legal Adventures of Tractor Conn Next Month

VICKERS HYDRAULIC CONTROLS

Are FASTER on Construction Equipment, too

When enemy fighter planes rushed in for the kill, bomber turrets had to start shooting right now. A split second often was the difference between life and death to the bomber crew. Guns had to move instantly and accurately at the will of the gunner. Vickers Power Hydraulic Control provided this speed and precision on many AAF bombers.

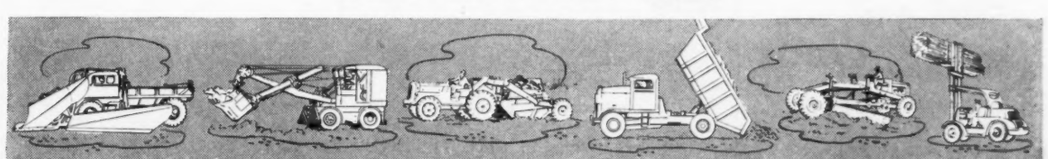
Fast, accurate control is important in construction equipment, too. While lives seldom depend upon it, machinery that can be operated rapidly, accurately and *continuously* may mean the difference between profit and loss.

Vickers has been building power hydraulic controls for construction equipment for 15 years. We've learned how to make them fast, accurate, and instantly responsive to the touch of a finger no matter how heavy the job. Vickers Power Hydraulic Controls have no clutches or brakes to wear or fail at critical times . . . no complicated linkages. Cables and sheaves are usually entirely eliminated but when used can be automatically protected against overload. Vickers controls employ oil to transmit the power impulses, hence are inherently self-lubricated and exceptionally durable.

VICKERS *Incorporated*

1494 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: Chicago • Cincinnati • Cleveland • Detroit • Los Angeles • Newark • Philadelphia
Rochester • Rockford • Tulsa • Worcester



ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

100%
Self Contained

SYNTRON

Gasoline Hammer

PAVING BREAKERS

No air compressor and hose
No battery box and cable

Will Save You—
MONEY
TIME and
LABOR

Write for illustrated folder

SYNTRON CO.
500 Lexington Homer City, Pa.

CONSTRUCTION EQUIPMENT NEWS

DECEMBER, 1945 REVIEW of Construction Machinery and Materials

FLAME CUTTING vertical and overhead, as well as horizontal surfaces, is facilitated by new magnetic straightedges. Whether plate is rusted, oily or painted, 18-lb. pull holds straightedge firmly to work. Torch tip is held at correct distance from work to insure uniformly clean and accurate cut.

They are easily adjustable to any bevel angle and bevels are cut in one operation. Made of specially heat-treated aluminum alloy, rigid as well as light in weight, they will not warp from heat and are resistant to corrosion. Available in lengths from 18 to 36 in.—**The B & W Co., 7610 S. Figueroa St., Los Angeles 13, Calif.**

★ ★ ★

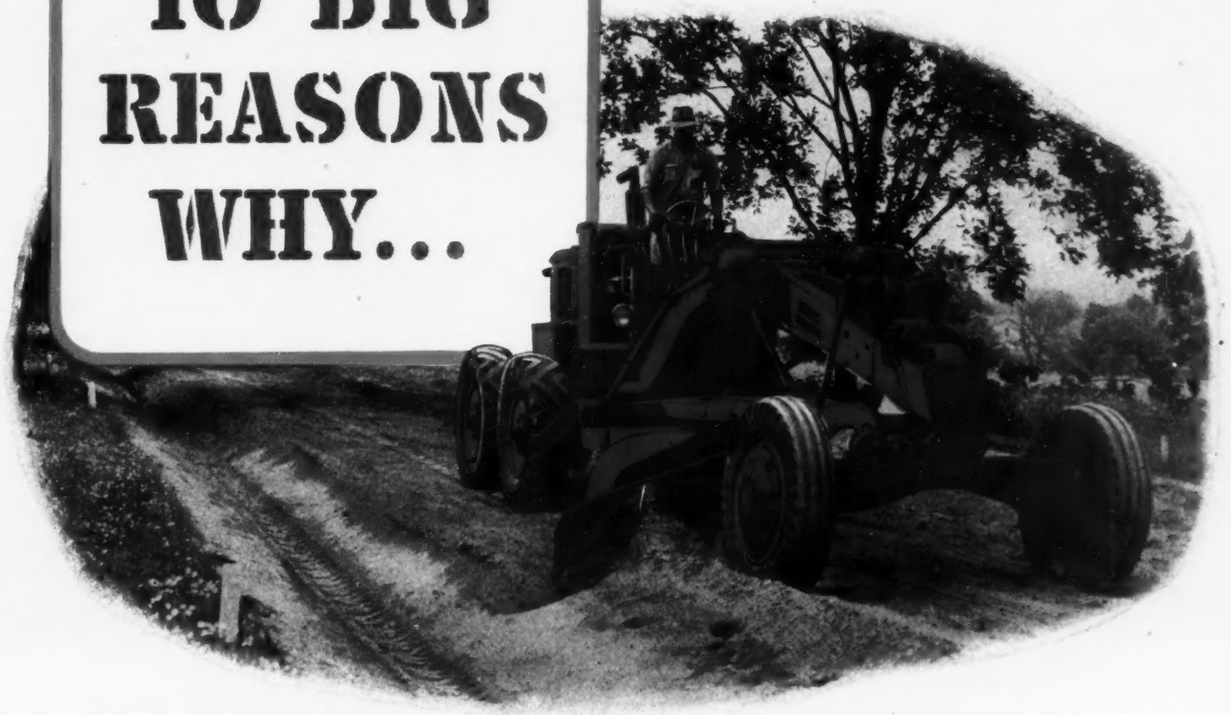
ARMOR-CLAD FULLY INSULATED ELECTRODE HOLDER (screw-type) is recommended for use to assure durability, maximum safety and minimum operator fatigue. Feature of new holder is head which is completely inclosed in a sheath of aluminum armor which protects insulation, resists weld spatter and eliminates possibility of accidental contact with welding surface. Holder remains clean while in use and lasts longer than insulated holders without armor. Designed to accommodate electrodes up to and including ¼ in. in dia., holder is easy to use, light in weight

(15 oz.), and cool in operation. Slight twist of hand tightens or releases electrode. While in use, holder firmly grips electrode at proper angle and good current contact is maintained. This keeps holder cool, tends to prevent overheating of electrode and maintains uniform melting rate clear down to stub end. Width of electrode also limits size of electrode which can be inserted, thus preventing overloading.—**General Electric Co., Schenectady, N. Y.**

★ ★ ★

VERTICAL DRIP-PROOF MOTOR rated at 40 deg. C. rise, continuous duty with a 15 percent service factor is designed for operation from 60 or 50 cycle, 3- or 2-phase circuits at all standard voltages. All ventilating openings are shielded against entrance of dripping liquids and falling particles. Oversize ball bearings are provided to carry thrust in addition to rotor, and use of centrifugal bearing seal permits use of softer greases for better lubrication and longer bearing life. Recessed junction box, which provides ample room for making electrical connections, a rotor with bars, fans and end rings cast in one operation from aluminum alloys, are used. Other features: heavy cast frame construction and coils protected with Vinylastic insulation.—**Crocker-Wheeler Division, Joshua Hendy Iron Works, Ampere, N. J.**

10 BIG REASONS WHY...



OWNERS PREFER ADAMS MOTOR GRADERS

★ There are many reasons why Adams Motor Graders are the outstanding choice of owners who demand the utmost in performance, utility, endurance and economy. Here are ten of the foremost:

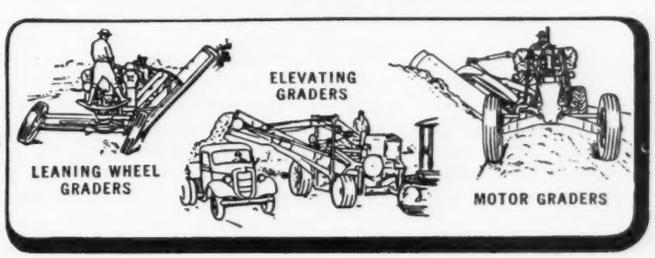
1. **STRENGTH AND DURABILITY**—Adams have the rugged strength and stamina to stand up under continuous hard work—with minimum maintenance and repair.
2. **BALANCED DESIGN**—Weight is distributed to exert adequate blade and scarifier pressures, utilizing full power and traction of Adams machines.
3. **POWER AND TRACTION**—All models powered by dependable International engines, with lugging ability to hang on in tough going. Suitable traction utilizes full engine power.
4. **ADAPTABILITY TO WIDE RANGE OF JOBS**—All models, from smallest to largest, are adaptable to every type of surface, ditch and bank work of which motor graders are capable.
5. **WIDE RANGE OF SPEEDS**—All models have wide range of working speeds, plus high top speeds for fast transport from job to job.
6. **EASY STARTING**—Push-button starting available—engine starts easily, in any weather.
7. **DEPENDABLE OPERATING CONTROLS**—Adams positive mechanical controls always operate at uniform speed, regardless of number used at any one time.
8. **ECONOMICAL OPERATION**—International engines are easy on fuel and oil—economical to keep up. All working parts of graders are adjustable for wear, insuring long life.
9. **BIG FRONT AXLE CLEARANCE**—Adams high-arch front axle provides exceptional clearance—no power wasted bulldozing axle through heavy windrows.
10. **WORLD WIDE DEALER SERVICE**—Adams machines are sold and serviced throughout the United States and Canada, and in 30 countries all over the world.

The proof of Adams superiority is in the performance facts. Ask your near-by Adams dealer for the full, convincing story.

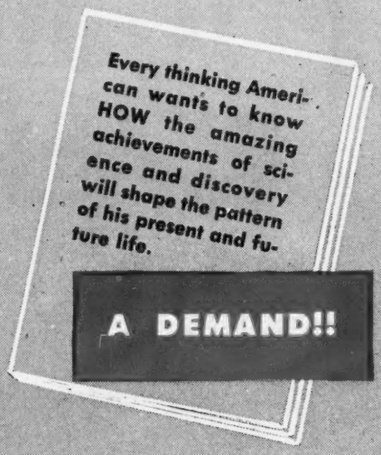
J. D. ADAMS MANUFACTURING CO.
Indianapolis, Indiana

Adams

ROAD-BUILDING AND EARTH-MOVING EQUIPMENT



You Can Become a Charter Member of the Best Informed Audience in the World


Every thinking American wants to know HOW the amazing achievements of science and discovery will shape the pattern of his present and future life.
A DEMAND!!

The job that SCIENCE ILLUSTRATED has set for itself has never been done before.

The need for such a magazine has long existed but the *demand* was never as pressing . . . the American public was never as inquisitive minded . . . as science-hungry . . . as deeply conscious of impending changes in our social and economic life as it is today.

SCIENCE ILLUSTRATED will cover the broad fields of science, invention, mechanics and discovery. It will discuss the new challenges and opportunities that are coming out of radar, the heady secret of the atom, and the amazing, world shaking advancements in communication and transportation.

It will interpret, for the progressive thinking layman as well as for the business man, the great new triumphs in drugs, medicines, chemicals, metallurgy, textiles, fabrics, food processes, materials, methods, procedures — the entire range of scientific achievement — in terms of their contribution to better living.

SCIENCE ILLUSTRATED will *report, interpret,* and *project!* It will be fast and fascinating reading — a thrilling new magazine for an exciting new world!

Experience Plus "Know-How" Will Produce SCIENCE ILLUSTRATED!

To bring you this month by month reporting of progress and achievement McGraw-Hill has assembled the finest talent available. Working hand in hand with the men pictured here is a top-flight staff of science writers, artists and photographers . . . men with long experience in making science *understandable* and *interesting.*

In addition, the editors of SCIENCE ILLUSTRATED will have at their command the great technical, consulting, research, and world-wide news gathering facilities of the McGraw-Hill Publishing Company. 196 editors, writers and technical experts, which staff the McGraw-Hill publications, will serve as consultants. All of McGraw-Hill's publishing experience and financial resources are behind this thrilling new magazine.

Dr. Gerald Wendt — Editorial Director: Editor, scientist, author, lecturer—most recently, full time science consultant for Time-Life . . . New York World's Fair Director of Science and Education . . . a practical, working scientist.

Harley W. Magee — Editor: Newspaper reporter, staff writer and, at one time, city editor for Associated Press in Chicago . . . formerly managing editor of Popular Mechanics . . . a writer with long experience in interpreting science for the lay reader.

Dexter Masters — Editorial Consultant: Editor of Army Air Forces magazine, "Radar" . . . formerly staff member Radiation Laboratory, Massachusetts Institute of Technology . . . formerly member of Fortune's Editorial staff . . . first editor of Tide.

Starting in April, 1946, McGraw-Hill will publish a thrilling new non-technical general magazine that will interpret, month by month, the impact of the scientists' world-shaping as it happens.
A PROMISE!!
Science
ILLUSTRATED
Meet a New and Different Magazine!

In its pages, month after month, the products, developments, and horizons of scientific achievement will come alive in terse, sparkling text and dramatic, colorful pictures.

The subjects discussed in SCIENCE ILLUSTRATED will be of vital importance to everyone in every walk of life. No matter where your interests lie—in the products and processes of business or in the things which make for better and more efficient living—you will read this new magazine with profit, and with interest.

If you would like to keep abreast of the world of tomorrow make your reservation NOW for the first twelve issues of SCIENCE ILLUSTRATED.

N. B. to Advertisers: **What kind of an audience will be available to you in SCIENCE ILLUSTRATED? Obviously, an alert, intelligent, forward thinking group of people . . . the sort of people that are a step ahead of the parade in interests, desires and purchasing power. The initial print order will be 500,000 copies. Forms close on February 10th for the April issue. Write to SCIENCE ILLUSTRATED or telephone your nearest McGraw-Hill office for complete information.**

FIRST ISSUE ON THE NEWS-STANDS APRIL, 1946

Price per copy 25 cents.

ANNUAL SUBSCRIPTION . . .

$3.00

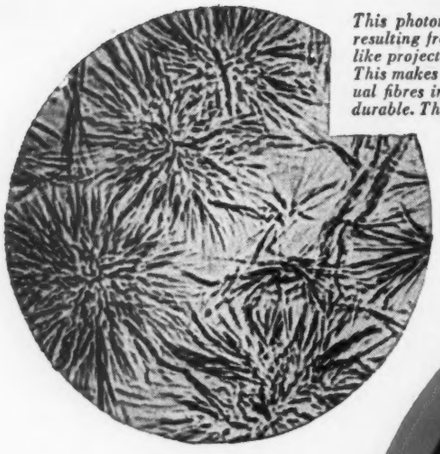
Science Illustrated
330 West 42nd Street
New York 18, New York

Yes—I want to become a charter member of the best informed audience in the world. Enclosed is my check (or money order) for $3.00. Please send me the first 12 issues of SCIENCE ILLUSTRATED—starting in April, 1946.

Name .....

Street and number .....

City and State .....



This photomicrograph shows the distinctive lead "soap" formations resulting from Red Lead's reaction with the vehicle. Note how the rod-like projections radiating from central cores spread out and intermesh. This makes a strong, flexible, interwoven structure—just as the individual fibres in a piece of cloth are intertwined to make cloth tough and durable. This type of soap formation is unique with "lead" paint films.

unique LEAD SOAPS...

another important reason why RED LEAD means Extra Rust Protection

Why is Red Lead outstanding as a metal protector?

One of the major reasons is this pigment's remarkable ability to impart to the paint film strong, tough, intertwining lead "soap" formations—as shown in the photomicrograph above.

These unique lead "soaps" improve the paint film in many ways. For one thing, they form a dense, intermeshing matrix which restricts the passage of water through the film. And rusting does not take place without the presence of moisture.

For another, they *mechanically* reinforce the film, giving it extra *strength* and *toughness.*

And again, Red Lead "soaps" contribute all-important *elasticity* — allowing movement along their intermeshing projections. This action helps prevent the ruptures to which a hard, unyielding film is subject. Moreover, when a paint film dries and ages, decomposition of the vehicle sets in. But, because of Red Lead's ability to combine with the decomposition products and form soaps, it increases both the durability of the paint film and its adhesion to the base metal.

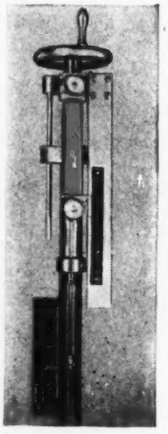
Red Lead's extra strength, toughness and elasticity are demonstrated by the tensile strength test below and substantiated by exhaustive research and field service.

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including phenolic and alkyd resin types.

Specify RED LEAD for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint.

* * *



In this tensile strength tester a typical Red Lead paint film has been stretched 18% without breaking. In withstanding this elongation it has maintained a load of 920 grams. Any film that exhibits these characteristics has unusual strength, toughness and elasticity. As metals expand and contract only a fraction of one percent, this film would adhere under the most extreme conditions.

No matter what price you pay, you'll get a better paint for surface protection of metal, if it contains Red Lead.

Write for New Booklet—"Red Lead in Corrosion Resistant Paints" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas—ranging from Red Lead-Linseed Oil paints to Red Lead-Mixed Pigment-Varnish types. If you haven't received your copy, address nearest branch listed below.

* * *

All types of metal protective paints are constantly being tested at National Lead's many proving grounds. The benefit of our extensive experience with Red Lead paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna); Philadelphia 7 (John T. Lewis & Bros. Co.); Charleston, W. Va. (Evans Lead Division).

DUTCH BOY RED LEAD

Thermoid —Key to Progress in Many American Industries

OLD-STYLE SCRAPER USED IN HIGHWAY CONSTRUCTION

MODERN SCRAPER USING THERMOID HYDRAULIC CONTROL HOSE

SINCE 1880, Thermoid has contributed to the progress of American Industry. In many fields of business, Thermoid Products play an indispensable part. The development of Thermoid Powerflex Wire Braid Hydraulic Control Hose has widened and accelerated the use of hydraulic controls on many types of equipment requiring flexible connections. The Thermoid Line* is the result of 65 years of research and experience that not only has kept pace with the demands of Industry, but in many cases anticipated industry's needs. The Thermoid Line* of belting and hose for materials handling and power transmission may contain the key to another step forward in the improvement of your process and the reduction of your costs — "It's Good Business to Do Business With Thermoid."

***THE THERMOID LINE INCLUDES: Transmission Belting • F.H.P. and Multiple V-Belts and Drives • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Sheet Packings • Industrial Brake Linings and Friction Products • Molded Hard Rubber and Plastic Products.**

Thermoid Rubber

DIVISION OF THERMOID COMPANY

TRENTON 8, NEW JERSEY

Contributor to Industrial Advancement Since 1880

You can do the job faster

...with extra savings in time and money when you use a

LEROI

Portable Air Compressor

A model 60 Le Roi Compressor speeds this residential sewer job.

WHEN you've got to work at top speed to keep ahead of fast-moving schedules, you appreciate the extra mobility of Le Roi compressors — and the dependable qualities built into every one.

Foremost among many features is the coordinated action between engine and compressor, eliminating costly vibration and resulting in greater efficiency. Because both engine and compressor are built to the precision standards of an engine builder, you get greater smoothness that results in longer life — controlled speed that is economical, yet keeps a constant supply of air on hand — and dependable performance that pays off in service and satisfaction. 60 to 315 c.f.m.—gasoline-powered and 105 to 500 c.f.m. Diesel-powered.

See your nearby Le Roi distributor or write for bulletins.

C-71

Le Roi Company

1712 S. 68th STREET • MILWAUKEE 14, WISCONSIN

Distributors Located in Principal Cities

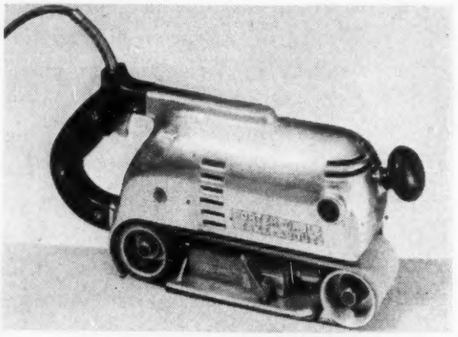
LE ROI MILWAUKEE

NYLON-TAPERED BRISTLES for post-war paint brushes provide required taper, resilience, toughness, length, and inertness to paint and cleaner ingredients. Testing on variety of surfaces proved that nylon brushes wear at least three times long-

er than hog bristle brushes. Bristles are strong, elastic and uniform in diameter. Nylon is moth- and vermin-proof, resists attack by all kinds of insects, will not deteriorate in storage and does not dry out or rot. Can be used with all types of paints, lacquers and calcimine.—**E. I. DuPont de Nemours & Co., Inc., Wilmington, Del.**

★ ★ ★

PORTABLE SURFACER, easy to handle and light in weight, is designed for durability and has a high belt speed that provides faster surfacing. Belt size, 3x24 in.; belt speed, 1,600 sfpm.; pulley size 3x2¼-in. dia.; bearings—ball and needle; overall size 5⅛x16x7¾ in.; weight, 14 lb. net; shipping weight, 21 lb. Special features: Higher



belt speed for faster grinding; perfect balance, assuring less fatigue for operator; modern streamline design; aluminum die-cast polished frame; plastic handle; quick acting trigger switch in handle; silent chain drive; needle bearing drive and idler pulleys; rubber covered drive pulley. Uses: Operations in maintenance departments, carpenter shops and boat building industries. Powered by Univérsal dc.-ac. 25-60-cycle, either 115- or 120-v. single-phase motor.—**Porter-Cable Machine Co., Syracuse 8, N. Y.**

New Alemite Lubrication Equipment to Keep Old Machines Rarin' to Go!

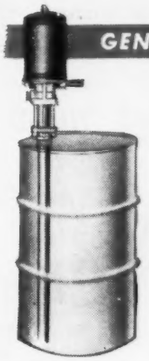
The stage is set for a revival of civilian construction—and all signs point to a boom! But, until you can get all the new machines you want, many old ones will have to do. That's why it's tremendously important to keep them in shape with proper, positive lubrication. And genuine Alemite Lubrication equipment will help you do a safe, dependable job.

GENUINE ALEMITE

Loader Pump

Model 6425 . . . portable, 35-lb. capacity pump for loading grease guns with light-bodied and semi-fluid lubricants. A very practical unit where machines being serviced are some distance from maintenance departments. Economical because it delivers lubricant only when gun is placed on loader valve. Complete with adapters and bracket for carrying gun.

GENUINE ALEMITE



Barrel Pump

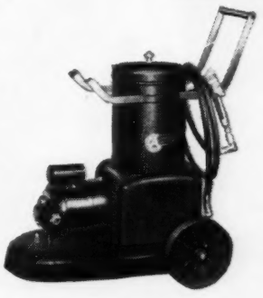
Model 7710 . . . air operated. A rugged, heavy-duty pump. Used for large volume delivery of oils or fluid gear lubricants. Ideal for filling large crank cases, housings and large bearings requiring oil. This pump fits directly into the bung hole of a 55-gallon drum.

GENUINE ALEMITE

Grease Gun

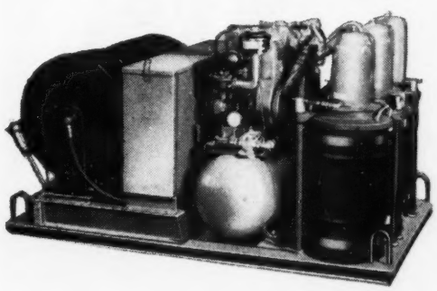
Model 6679 . . . here is a heavy-duty gun that can take abuse and still do a dependable lubrication job. Has 21-ounce capacity and handles fibrous, heavy and light-bodied greases. Develops up to 5000 pounds pressure. Easily and quickly filled through a loader valve or by removing the cylinder head. It is spring primed. Extra long handle gives maximum operating ease. Used with hose or adaptors.

GENUINE ALEMITE



Portable Electric-Power Gun

Model 7191 . . . a high pressure unit complete with 25-lb. container. Standard model—110 volt A.C. Others available on request. Handles all types of light-bodied lubricants and delivers approximately 9-oz. per minute. Automatic switch shuts off motor at 5000-lbs. pressure. Rolls on two large rear wheels and one front Bassick caster. Comes completely equipped, ready to use.



Genuine Alemite Portable Service Station

Model 2417 . . . a version of the famous Alemite Portable Service Stations used on hundreds of high-priority wartime construction projects. This unit brings power lubrication out to machines on the job . . . services pressure gun fittings, gear housings, final drives, rear axles, transmissions and crank cases.

ALEMITE

First in Modern Lubrication

STEWART WARNER

For complete details, consult your Alemite distributor—or write direct to Alemite, 1840 Diversey Parkway, Chicago 14, Ill.

CONSULTATION • ENGINEERING • EQUIPMENT • LUBRICANTS • MAINTENANCE

HOISTS • BODIES • WINCHES
ROAD MACHINERY • CRANES
There IS a Reason
Gar Wood—World's Largest Manufacturer of Truck and Trailer equipment—earned this leadership through ability to engineer and build units of such outstanding performance that men who know equipment best specify Gar Wood.
BUY VICTORY BONDS
GAR WOOD INDUSTRIES, Inc.
DETROIT 11 MICHIGAN
GW

Other Products: • TANKS • HEATING EQUIPMENT • MOTOR BOATS

RIGGERS' HAND BOOK FREE
Shows sling types, fittings, capacities. Write for your copy.

*PATENTS: U. S., 1475859, 1584671, 2142641, 2142642, 2299568; CANADIAN, 252874, 258068

Give us the "picture"... we'll fit your routine lift or special job with the correct YELLOW STRAND *BRAIDED* SLING*

It can be a blueprint, sketch or description. Given an accurate "picture" of your lifting problem, we will suggest a practical answer. And because it will be in the form of a Yellow Strand *Braided* Safety Sling, you'll get an efficient sling with these advantages: increased protection for men and loads, easy-to-manage flexibility, high kink-resistance, light weight.

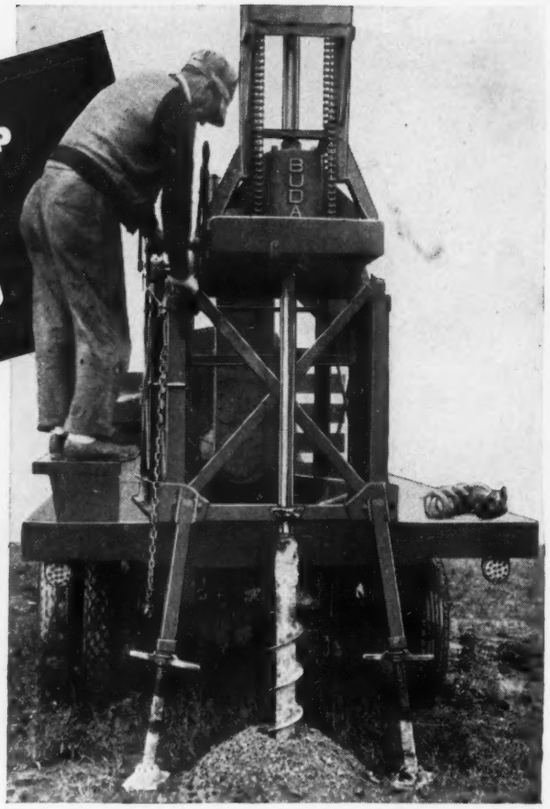
Is the load slippery or awkward, requiring a choker grip? Should it be cradled in a basket hitch... picked up by the edges... hooked through eyebolts... kept level? For such recurring situations in factories, foundries, shops, utilities, warehouses and construction industries, there are numerous types of Yellow Strand *Braided* Slings. One may fit your case. But if you need an original sling—perhaps with spreader bar or special hooks—we'll design a custom job embodying the stamina of Yellow Strand Wire Rope and the time-saving features of the patented *braided* construction.

Send details of your application now and let B & B engineers offer a recommendation. Broderick & Bascom Rope Co., St. Louis 15, Mo. *Branches:* New York, Chicago, Houston, Portland, Seattle. *Factories:* St. Louis, Seattle, Peoria.

BRODERICK & BASCOM
Yellow Strand
BRAIDED SAFETY SLINGS

For Deep Holes or Soil Testing

Cuts Down Set-up Time



BUDA HBH *Earth Drill*

• The BUDA HBH Earth Drill can be quickly set up for soil testing or deep hole drilling to a depth of 100 feet . . . through average soil at faster than a *foot every two minutes!*

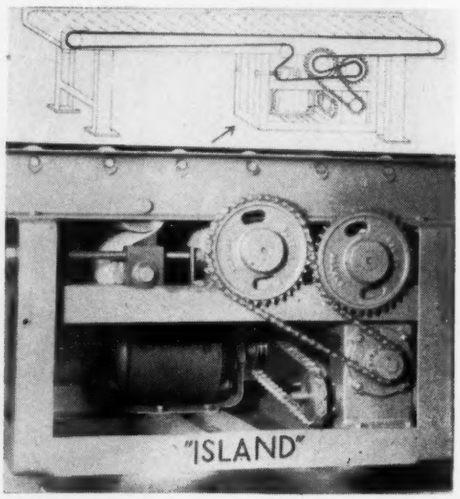
Other BUDA Earth Drill models available for pole line work, foundation piers, guard rail installations, post holes and preboring for piles. Write or wire today for literature.

BUDA

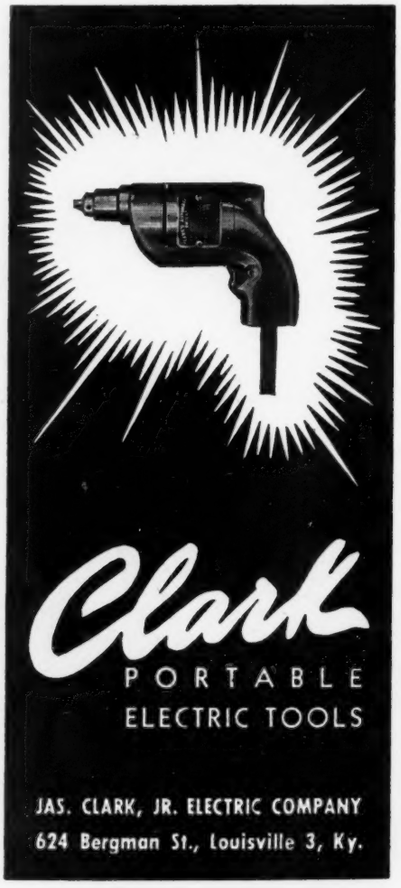
15425 Commercial Avenue

HARVEY (Chicago Suburb) ILLINOIS

UNIT CONVEYOR DRIVE, known as "Power-Pac," is a self-contained assembled unit built in an iron frame ready for quick and secure bolting to chassis of any piece of conveying equipment that needs to be mechanically operated. Consists of motor, driving rolls, switch speed reducers,



controls, proper gears and all necessary mechanism to enable user to make proper connections with equipment. Plug into electric socket and it is ready for use. Motorizes ordinary gravity conveyor permitting it to carry up grade where needed. Unit measures 15x24x17 in. and weighs 167 lb., crated for shipment.—**Island Equipment Corp., 101 Park Ave., New York 17, N. Y.**



Clark

PORTABLE ELECTRIC TOOLS

JAS. CLARK, JR. ELECTRIC COMPANY

624 Bergman St., Louisville 3, Ky.

Low Cost Dirt-Moving with
INTERNATIONAL TRACTORS

The cost factors of power go down to bedrock when International Diesel Tractors do the dirt moving. *Low fuel consumption for work done* is the first benefit. *Greatly reduced maintenance* assures savings of time and money. *Long-lived stamina* reduces depreciation write-offs. And their *adaptability to all kinds of work* keeps International Crawlers forever busy.

There's a size of International TracTracTor or Wheel Tractor for almost every kind of power need—well adapted to any application you may have in mind.

Ask the International Industrial Power Distributor near you for information and help in selecting the best power and equipment for the projects you're planning.

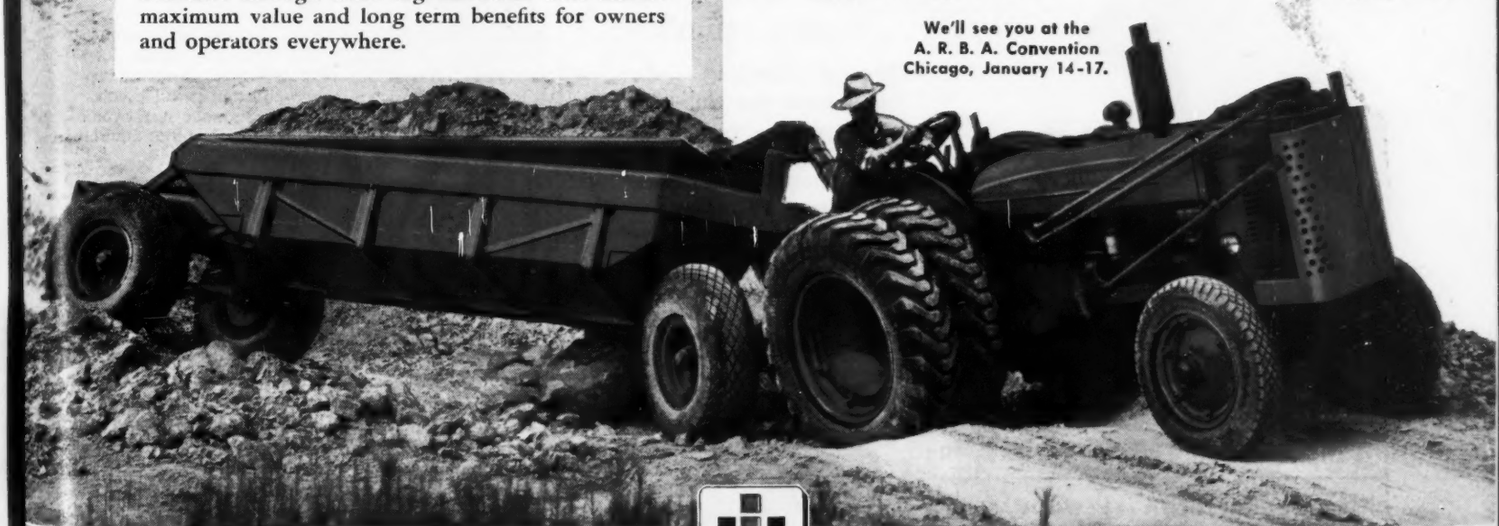
Dependable after-sale service is provided all owners of Internationals by distributors and dealer organizations that span the continent and circle the globe. Factory replacement parts and equipment built for use with International Tractors and Power Units are available through these organizations. This assures maximum value and long term benefits for owners and operators everywhere.

Industrial Power Division

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue **Chicago 1, Illinois**

We'll see you at the A. R. B. A. Convention Chicago, January 14-17.



INTERNATIONAL INTERNATIONAL HARVESTER **Industrial Power**

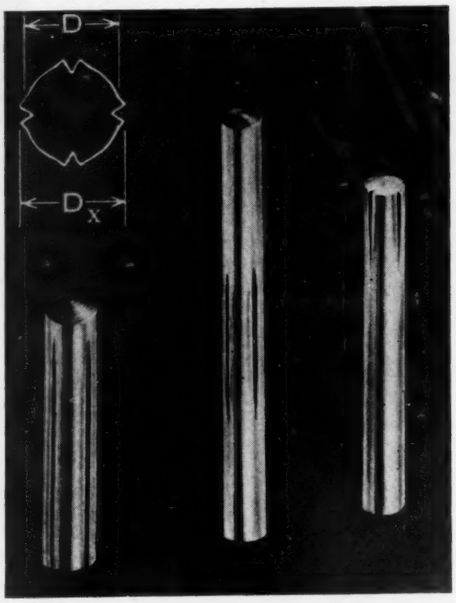
MEMO
TO ALL CONSTRUCTION SUPTS.:—
Have we been taking "BUCKETS" too much for granted? What about HAISS high power ratio 7:1
J.J.B.

For Catalogs, Prices, Deliveries Write or Wire

HAISS
HI-POWER BUCKETS

GEORGE HAISS MANUFACTURING CO., INC., 139th STREET & CANAL PLACE, NEW YORK 51, N. Y.

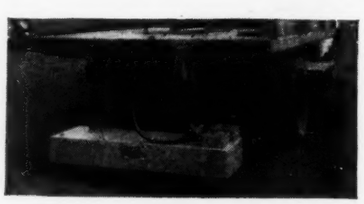
SELF-LOCKING PINS named "Driv-Lok," are designed to replace more expensive taper pins, keys, cotter pins, set screws and rivets. These self-anchoring, vibration-proof pins are pressed or driven into standard drill holes and have four flutes on surface parallel to axis. Length and position of flute can be accurately controlled so that fully or partially grooved pins are available. Fully grooved pins have pilot at one end so pin can be easily inserted. Raised, work-hardened edges of



flutes provide expanded diameter of few thousandths greater than nominal diameter of pin. When inserted in drilled hole, raised edges are compressed inwardly, providing resilient self-locking element which maker claims will hold indefinitely under vibration or shock conditions. Available in sizes from 3/64- to ½-in. dia. and from 3/16- to 4½-in. length, in any material, and in wide variety of types.—**Driv-Lok Pin Co., 565 W. Washington Blvd., Chicago, Ill.**

★ ★ ★

ROAD SWEEPING MAGNET, rectangular suspension type, high intensity unit, is now available for sweeping roads clear of tramp iron. Machine is double-gap model with gaps constant at all points to promote even distribution of magnetic flux over entire magnet face. Manufacturer claims that equal



pull thus exerted enables magnet to remove tramp iron from all the road area covered. New magnet operates from generator set carried on truck and comes in complete range of sizes. Complete units including magnet, generator and trailer, are available.—**Dings Magnetic Separator Co., 509 E. Smith St., Milwaukee 7, Wis.**

MERCER
Material Handling Equipment
"THE NAME THAT CARRIES WEIGHT"

Mercer End Dump Cart. Trailer type. Ideal for handling bulk. Acute pitching angle. Designed to dump free and clean. Various sizes. Furnished with steel or vulcanized-on type solid rubber tire wheels.

END DUMP CARTS
. . . TOOL WAGONS
. . . TRAILER TRUCKS
—Special Handling Equipment for the Construction Industry

Trailer Trucks, Tractor Cranes, Tool Wagons, Utility Carts . . . Material Handling Equipment of every type. Designed to your requirements by experienced engineers. Literature available.

Inquiries invited.

Address Your Inquiry to ➡

MERCER ENGINEERING WORKS, Inc.

WORKS: CLIFTON (ALLWOOD) N. J.

Sole Representatives
MERCER-ROBINSON CO., Inc.
30 CHURCH ST.
NEW YORK 7, N. Y.

LOW CARBON . . . NO CORROSION—

AFTER 1,172 HOUR RUN ON THE JOB!

AFTER 1172 HOURS of grading, excavating, and roadbuilding at an Indiana ordnance plant, a bulldozer's 6-cylinder engine was disassembled for inspection. It was the final act in a carefully supervised field test to establish how well Shell's Diesel lubricant, Talpex E, performs under actual, heavy-duty working conditions. Here are the results:

Carbon formed only in a thin deposit above the ring belt of cylinders #4, 5 and 6; and around the crown, heat groove, and between the first and second ring grooves on the anti-thrust side of piston #5. *Otherwise no carbon formed on pistons or cylinders.*

There was no sign of corrosion on bearings or other engine parts. Neither was there any sign of scuffing or abrading.

Both owners and operators of the bulldozer pronounced this performance of Shell Talpex E "highly satisfactory."

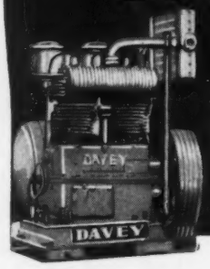
This is but one of many favorable performance records made to establish the efficiency of Talpex E for all makes of Diesel engines. The other tests revealed almost identical results with Talpex E—the oil that not *only* lubricates but: (1) Has high detergency; (2) Exceptional oxidation stability; (3) Low carbon-forming tendency, and (4) Is non-corrosive to alloy bearings.

For more facts on Shell Diesel Lubricants, get in touch with Shell Oil Company, Incorporated, 50 West 50th Street, New York 20, New York; or 100 Bush Street, San Francisco 6, California.

SHELL DIESEL LUBRICANTS

SHELL

THE TRUCK IS GONE—
THE COMPRESSOR LIVES ON!
IT'S A DAVEY



"During July 1935 we purchased a Davey air cooled compressor with power take-off for a 1935 1-1/2-ton truck. As this compressor is still in good working order and our truck is wrecked, can you furnish complete all necessary parts for the purpose of mounting this compressor in a new 1945 truck."

EVIDENCE of built-in long life, economy and satisfactory service of Davey air compressors is presented in this letter from a large utility company. The owners not only received full satisfaction, they are convinced that the Davey Auto-Air is work-ready, as capable as ever.

During its first ten years of service, this Davey Auto-Air brought its owners many exclusive Davey economies in money, time, manpower. The original cost was lower, because the truck-engine-driven compressor made a second engine unnecessary. Time was saved through the years, because it was always on the job when needed, along with tools and materials.

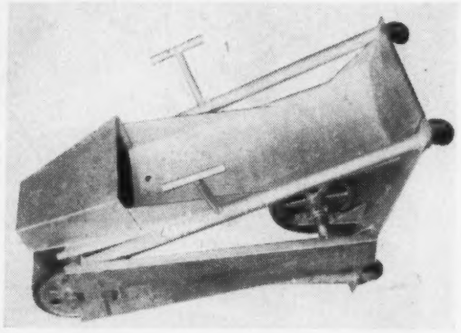
Davey compressors deliver their rated air capacity over a longer period of time than any other compressor made. Davey air-cooled aluminum alloy cylinder heads, permanently carbon-free, guaranteed-for-life, stainless steel valves and conservative speed operation are just a few of the factors that make Davey compressors the leader in performance, long life and economy.

For Complete Information on Davey Auto-Air compressors, Air-Aristocrat trailer compressors, industrial compressors, heavy-duty truck power take-offs and pneumatic saws, write today for free catalog E-172. It can mean savings you've never known before.

D-1045-6

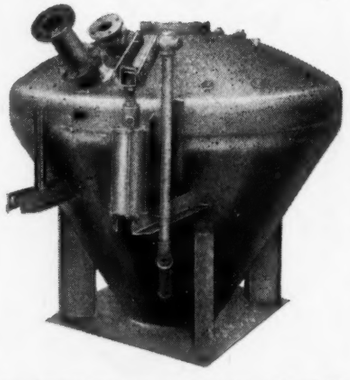
DAVEY *Compressor Co.*
KENT · OHIO
DEALERS IN PRINCIPAL CITIES

BAG DUMPER, operating on a ¼-hp. electric motor, lifts and empties cement, ore and other materials that are packed in bags weighing up to 350 lb. Eliminates back breaking lifts and fatigue; prevents accidents; stops wastage from spilling; keeps floors clean; reduces dust; may be wheeled



about as needed. Automatic shut-off switch stops motor at top and bottom positions of lift. Added safety feature: special clutch arrangement disengages motor if downward return of chute is obstructed. Upward lift takes 10 sec., with 8 sec. to lower. Adjustable height chute at front fits narrow openings and funnels bags' contents into vat or machine without spilling. Two spikes catch and hold bag while dumping. Chute will handle bag 24 in. wide.—**ASCO Manufacturing Co., 601 So. Anderson St., Los Angeles 14, Calif.**

Move Cement by Air-Floating It!



The ROBINSON AIR-ACTIVATED CONVEYOR SYSTEM is practical and efficient, saving in air and maintenance. It has been used on numerous big construction jobs as well as in process plants.

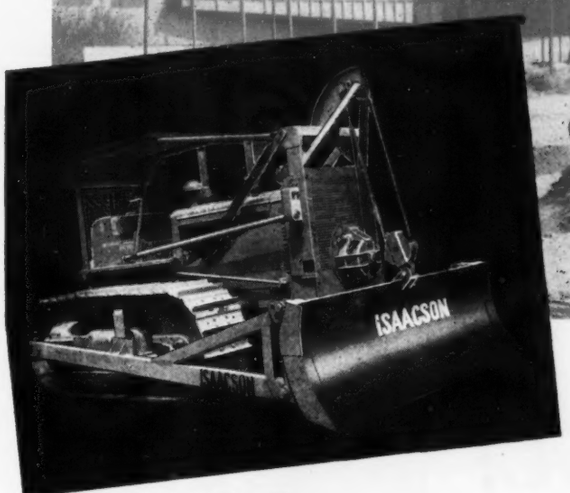
You can order the entire system installed including compressor, piping, storage tanks, etc. or just the activator, such as illustrated, to be used with your own accessory equipment.

Write for illustrated Bulletin No. 310

ROBINSON AIR-ACTIVATED CONVEYOR SYSTEMS

Division of MORSE BOULGER DESTRUCTOR CO.
211-C EAST 42nd STREET, NEW YORK 17, N.Y.
Representatives in all Principal Cities

THE BIG CONSTRUCTION PROGRAM IS ON!



KABLE TRAC-DOZERS—are available in either 'Straight' or 'Angle' blade models and can be used with single or double drum, front or rear mounted, power units.

ISAACSON KABLE TRAC-DOZERS *Will be on the job!*

THE POST WAR ERA IS HERE. We are now entering a period marking the beginning of a five billion dollar construction program. Railroads, highways, airports and other large construction projects like the one pictured, are under way. These jobs will go to the contractor who has modern, quality built equipment with a reputation for low operating and low maintenance cost.

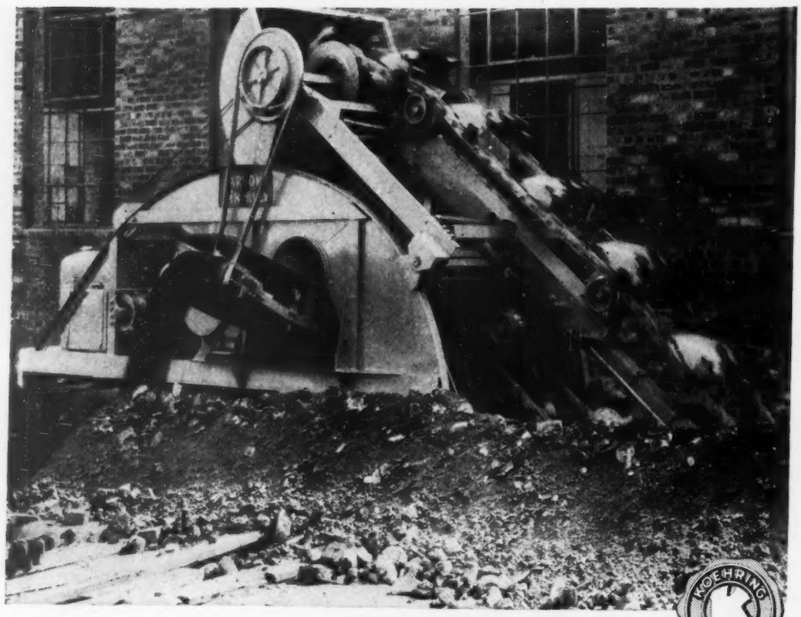
The Isaacson Kable Trac-Dozer has earned a wide reputation for continuous, profitable operation on rough, tough western jobs. Much of this reputation is the result of good *balance*. The Isaacson Kable Trac-Dozer is engineered for *balance* with your tractor. Load weight is properly distributed. This reduces wear . . . prolongs equipment life . . . and at the same time assures good traction. An Isaacson Kable Trac-Dozer gives you smooth, fast cable operation . . . powerful high lift . . . instant low drop . . . low cost yardage . . . fast dirt moving.

Write direct today for complete descriptive literature—be equipped for big jobs ahead.

ISAACSON

Tractor Equipment

A PRODUCT OF THE ISAACSON IRON WORKS • SEATTLE



IDEAL FOR CITY WORK...

221 PARSONS TRENCHLINER

The new Parsons 221 Trenchliner, public service model in the Parsons line of trenchers, sidesteps surface obstructions as close as 10" to either side of the projected trench. Boom shifts from side to side across entire width of boom carriage. Easy to shift, because it rides smoothly on big diameter rollers. Arc type spoil conveyor reaches up 6' 9", easily dumps into 1½-ton trucks. Telescoping ladder type boom can dig over and under obstructing pipes in trench, virtually eliminating hand work.

CONDENSED SPECIFICATIONS:

DEPTH OF TRENCH:	Up to 8'-0"
DIGGING WIDTHS: Buckets:	16", 20", 24"
with Special Teeth:	22", 26", 30"
with Sidecutters:	28", 32", 36"
DIGGING SPEEDS:	25—from 2" to 118" per min.
BUCKET LINE SPEEDS:	5—31 to 232 ft. per min.
TRAVELING SPEEDS:	5—½ to 2¾ miles per hr.
CONVEYOR BELT SPEEDS:	5—48 to 357 ft. per min.

NEW 221 TRENCHLINER CATALOG JUST OUT!

PARSONS COMPANY

KOEHRING SUBSIDIARY **NEWTON, IOWA**

TRENCHING EQUIPMENT

NEWS FROM MANUFACTURERS

About Their Products

The publications reviewed below will keep you posted on latest developments in construction equipment and materials available for your use.

WOOD PRODUCTS—**New York State College of Forestry, Syracuse University,** Syracuse, N. Y. Includes papers presented at Conference on New Developments in Wood Products. Among topics covered are: Influence of modern glues on use of wood; recent developments in fire-resistant treatment; new uses of glued-laminated timber structures; synthetic resin laminating for marine use, and outlook for wood-using industries in New York State.

★ ★ ★

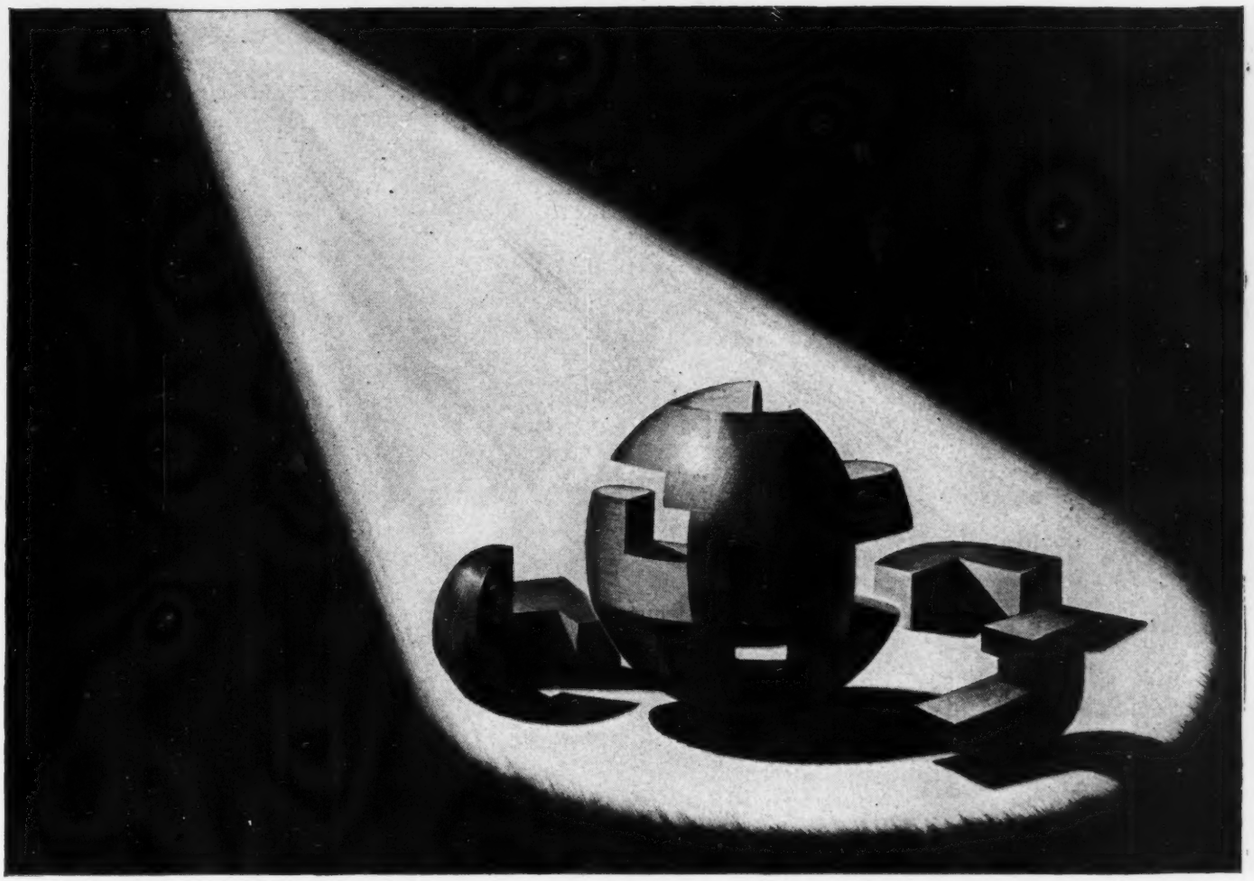
HOW TO PREVENT TRUCK TIRE FAILURES—**B. F. Goodrich Co.,** Akron, Ohio. (16 pp., illustrated) Gives case histories on eight factors which cause most failures: Overloading, improper inflation, excessive speed, impacts, mechanical irregularities, improper matching of duals, cuts, and punctures. In each case suggested remedies are given.

★ ★ ★

CLAY PIPE AND FITTINGS—**Clay Sewer Pipe Association, Inc.,** A.I.U. Building, 50 W. Broad St., Columbus 15, Ohio. (8½x11-in. booklet) Contains specific dimensional and specification reference data applicable to full line of clay pipe and fittings. In cooperation with the U. S. Bureau of Standards, clay pipe industry has standardized its products. Tables are arranged for convenient use of engineers, architects, draftsmen and purchasing agencies. Copies available upon request to above Assoc.ation.

★ ★ ★

COATED LENS SYSTEMS FOR SURVEYING INSTRUMENTS—**David White Co.,** Milwaukee 8, Wis. (4 pp., illustrated) Describes and illustrates use of coated lens in manufacture of surveying instruments which, manufacturer claims, increases brightness by as much as 40 percent and improves image contrast. In ordinary lens it is estimated that there is a 43 percent light loss in an internal focusing telescope, commonly used in surveying. In coated lens, light transmission is greatly increased, resulting in a brighter image—also a sharper image with greater contrast by reducing haze caused by internal reflections.



The right wire rope is the *Solution* to every rope problem!

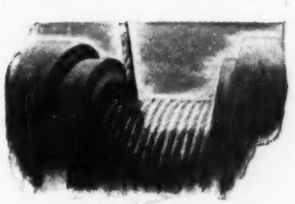
Selection of the *right* wire rope determines true rope economy. Every wire rope design is planned to resist a certain type of destruction.

For instance, few but heavy wires in the strands make a rope that long withstands abrasion but is not built to take bending. The rope made of many small wires resists bending but can't take too much abrasion.

Longest wire rope service results from the correct combination of resistance characteristics to meet the destructive forces present in each application.

Long, safe, economical life is *engineered* into every Wickwire Rope through modern wire-steel research and control—in our own laboratory. Here, the *right* characteristics can be accurately predetermined by scientific metallurgic control over the admixture and blending of steel-making elements.

Wickwire Rope quality is further safeguarded by the exact wire drawing procedure to fit the type of service which each finished wire rope is to perform.



Thousands of wire rope users—old hands and new—have found our specially prepared manual, "Know Your Ropes," valuable in making their work easier and prolonging rope life. It contains 78 "right and wrong" pictures, 40 wire rope life savers, 20 diagrams, tables and charts. Send for your FREE COPY today.

WICKWIRE SPENCER *Steel Company*

500 FIFTH AVENUE, NEW YORK (18), N. Y.

ABILENE (TEX.) • BOSTON • BUFFALO • CHATTANOOGA • CHICAGO • CLINTON (MASS.) • DETROIT • HOUSTON • LOS ANGELES • PHILADELPHIA • SAN FRANCISCO • TULSA • WORCESTER

Service— WHERE YOU NEED IT!

From the service angle alone, you, the owner of an Insley Excavator, have two big points in your favor for profitable completion of your "bids." *First* is the nation-wide organization of more than 50 Insley Sales and Service Representatives which assures you complete service facilities, competent mechanics, genuine Insley parts, within easy reach, wherever you are.

Second is Insley's policy of backing up dealer service . . . the policy that is summed up in this pledge to every owner of an Insley Excavator: That at least 96% of all replacement parts orders for current model Insley equipment will be shipped from the factory the same day as received.

For low-cost yardage on your job . . . for service *where you need it* and *when you need it* . . . contact your Insley Dealer today.

INSLEY MANUFACTURING CORP., INDIANAPOLIS 6, IND.

FLEXIBLE SHAFT MACHINES — **Wyzenbeek & Staff, Inc.,** 838 W. Hubbard St., Chicago 22, Ill. (32 pp., illustrated) Presents complete line of Wyco armored flexible shafts, replacement cores and casings and tells how to care for them. Catalog No. 44 also covers new hy-speed saw, hole and washer cutters, angle drilling attachments, and flexible shaft accessories. Concrete vibrators and grinders are also covered.

★ ★ ★

EARTHMOVING CONTRACTOR—**Caterpillar Tractor Co.,** Peoria 8, Ill. (16 pp., illustrated) Entitled "There's Work to Be Done," booklet illustrates numerous jobs previously done by earthmoving contractor and gives indication of big job that lies ahead in post-war period.

★ ★ ★

HANDBOOK OF KNOTS—**The Cornell Maritime Press,** 241 W. 23rd St., New York City. (224 pp., illustrated) Handy pocket-size book illustrates and explains 428 knots and ties in detail, including hitches, ties, bends, sheepshanks, bowlines, simple knots, ornamental and trick knots, mat weaves, sennit braiding, end rope knots, back splices, eye splices, short and long splices, horseshoe splices, grommets, whippings, seizings, miscellaneous knots and braids, and slings. Knots used in 48 different occupations and avocations are covered, including electricians, riggers and steeplejacks. Price $1.00.

GRIFFIN

GRIFFIN

WELLPOINT SYSTEMS

JETTING PUMPS

FOR SALE RENT

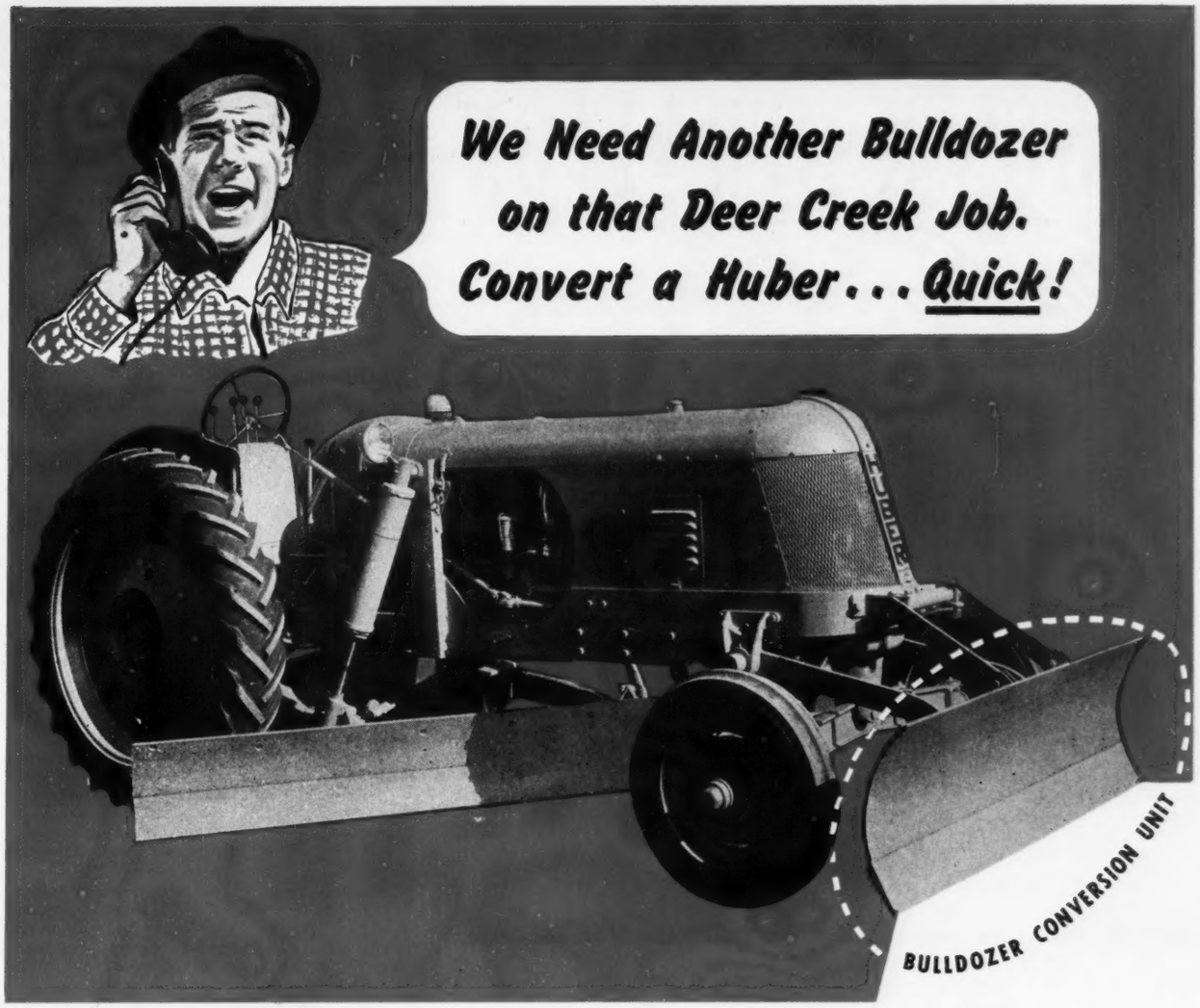
Prompt Shipments

Send for our New 60 page illustrated catalog "GRIFFIN POINTED WELLPOINT FACTS" chock full of latest information on Wellpoint Systems for dewatering, emergency and permanent water supply systems, also information on pressure pumps and data for jetting.

GRIFFIN WELLPOINT CORP.

881 EAST 141st ST. • NEW YORK 54, N. Y.

Phones: MElrose 5-7704-5-6



Just connect the bulldozer conversion unit illustrated here to a Huber Maintainer . . . it's as simple as that . . . and you have a bulldozer which will move plenty of dirt for you . . . and move it fast! Huber's bulldozer unit has a 6' blade, 20" deep, which can be raised and lowered hydraulically from 20" above to 1" below ground level. There's plenty of push behind it, too—thanks to the Maintainer's sturdy, dependable 32 horse engine. Why not ask your nearest Huber distributor for a bulldozer demonstration . . . today?

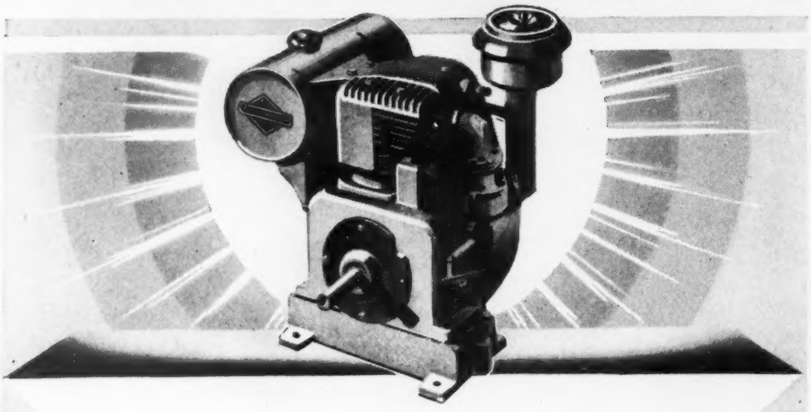
THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER

3 WHEEL & TANDEM ROLLERS

YEAR 'ROUND MAINTAINER

POWER WITH
BRIGGS & STRATTON
Air-Cooled Engines
YOUR ASSURANCE OF
MAXIMUM PERFORMANCE



In a brilliant record of dependable and economical operation — well above 2¼ MILLION Briggs & Stratton 4-cycle gasoline engines have *earned undisputed* recognition as "preferred power" the world over. Current models are the result of skill and experience gained during more than 26 years of *continuous production* of single-cylinder Air-Cooled engines — and constant advancements in design and precision manufacture. These distinctive Briggs & Stratton advantages are your assurance of *maximum performance* — the *right power* — whether you build, sell, or use gasoline-powered appliances, machinery, or industrial equipment.

BRIGGS & STRATTON CORPORATION
Milwaukee 1, Wisconsin, U. S. A.

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

Air-Cooled Power

BEARING APPLICATION—**New Departure, Division of General Motors Corp.,** Bristol, Conn. (24-p. treatise) Covers most important fundamentals of bearing mounting applicable to all types; preloading methods and their effect on housing fits; effect of press fits on preloading; effect of preloading on bearing life; bearing creep; use of duplex bearings; and shield and sealed bearings. Contains 78 drawings and charts. Companion book entitled "Details of Design" covers shaft and housing design for ball bearings.

★ ★ ★

OVERLAY ELECTRODES — **SightFeed Generator Co.,** Richmond, Ind. (4-p. bulletin) Explains properties and characteristics of Rexaloy electrodes, new metallic coated overlay rods for use on ac. or dc. machines. Describes procedure and operating technique for their application. Price list is also given.

★ ★ ★

MINE, QUARRY AND GRAVEL PIT EQUIPMENT—**Pioneer Engineering Works,** Minneapolis, Minn. (16 pp., illustrated) Describes and illustrates overhead, eccentric-type jaw crushers with force-feed and double-action crushing stroke, double-roll crushers with manganese steel shells; forged steel heavy-duty feeders with ½-in.-thick pans supported on wide rollers; manganese feeders built for handling heavy ores, larger lumps of broken rock at quarries and abrasive slag at steel plants; traveling grizzly feeder designed to supply primary crusher and at same time bypass quarry dirt or fines; reciprocating plate feeder for feeding on to belt conveyor all types of loose materials, such as gravel, sand and ore; standard lightweight conveyor recommended for most conveyor requirements; Mesabi heavy-duty conveyor for handling materials such as iron ore; 3-roll troughing idlers; lattice steel frame, Timken roller bearing or plain bearing portable conveyors; gravity belt tighteners; winch-type belt tighteners; conveyor terminal equipment including head and tail pulley assemblies, snubbing pulleys, drives, clutches and backstops; inclined, positive action eccentric-type vibrating screen, revolving screens including all-steel frame, screen plates or wire mesh and driving mechanism and double strand and screw-type dehydrators for dewatering sand.

★ ★ ★

RIGID STEEL STANDARD BUILDING—**National Machine & Foundry Co.,** 313 Sixth Ave., Pittsburgh 22, Pa. (8 pp., illustrated) Contains engineering data and complete information on rigid steel construction which is, essentially, rigid frame design as compared with truss design. It is stiff-jointed structure made up of system of beams, joined together to form rigid frame and designed so that all field connections are bolted. Frame is constructed of hot-rolled shapes. Standard cover consists of especially fabricated galvanized steel sheets. Simplicity of design requires minimum possible parts, two columns and two rafters.

YOU CAN PUT FULL LOADS

28 feet ABOVE GROUND LEVEL WITH Multifoote Pavers

Multiplies your profit opportunities

SIMPLY by adding an inclined boom, MultiFoote Paver is ready to mix and pour concrete for paving highways and airports and for countless other concrete mixing jobs on buildings, walls, dams and other structures, as high as 28 feet above ground level. This often means a considerable saving in equipment by eliminating the need for a crane or other similar machine for hoisting the concrete into position. The inclined boom can be raised or lowered by power to any position from horizontal to an incline of approximately 35°. Drive mechanism is mounted well back of the discharge end of the paver so the boom can be angled sharply to left or right. Bucket is suspended vertically regardless of the incline of the boom and can be dumped at any point on the boom.

Thorough mixing, high capacity, faster charging and discharging, added to the flexibility provided by the inclined boom make the MultiFoote the ideal machine for helping you obtain your full share of the huge construction program now getting under way. Get the profit-making facts on MultiFoote Pavers and the inclined boom from your nearest Foote distributor or write direct.

THE FOOTE COMPANY, Inc.
1910 State St. • Nunda, N. Y.

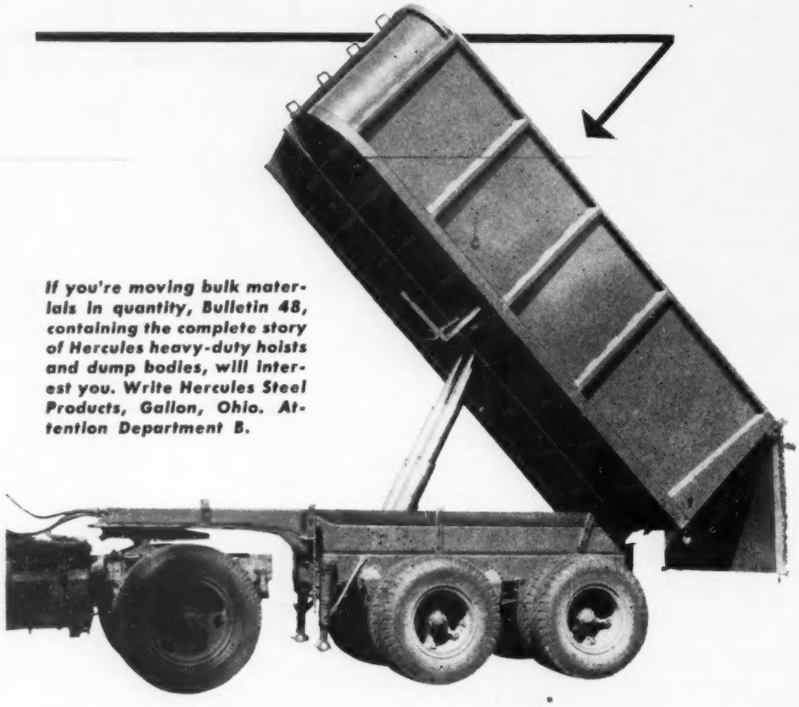
ARMY E NAVY

MULTIFOOTE
CONCRETE PAVERS

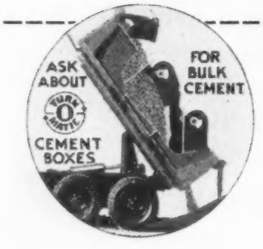
RAILROAD WITHOUT RAILS!

Just two trips with one of these 22-ton Hercules trailer dump bodies and you've moved a full railroad carload of limestone, gravel, coal, crushed stone or any other bulk material. These designed-for-duty, built-for-business dump bodies carry 17 yards in every load—that's moving material the BIG way!

And it's the economical way, too, for one 22-ton load, moved quickly and easily in a Hercules trailer unit, eliminates numerous trips with dump trucks of lesser capacity, cuts time, labor and operating costs to the minimum. This extra capacity also makes it practical to move materials longer distances by truck, avoiding additional handlings required with combined truck-rail hauling.



If you're moving bulk materials in quantity, Bulletin 48, containing the complete story of Hercules heavy-duty hoists and dump bodies, will interest you. Write Hercules Steel Products, Galion, Ohio. Attention Department B.



Ask About Turn-O-Matic Cement Boxes for Bulk Cement—Now Available—Write Today

HERCULES

DUMP BODIES AND HYDRAULIC HOISTS
SPLIT SHAFT POWER TAKE-OFFS • COAL CONVEYORS

HERCULES STEEL PRODUCTS COMPANY . . . GALION, OHIO

Well-Tooled Job Shop

(Continued from page 96)

time when operations were at their height, the asisstant contract superintendent in charge of equipment for the Bureau of Yards and Docks was Chief Warrant Officer R. N. Baroux, and the

(Continued on page 141)

FOR CLEANING AND REMOVING GREASE from truck-mixer parts, M. J. Boyle Co. installs this Heetmaster hot alkali bath from which International K7 gasoline engine has been removed by Yale spur-geared chain hoist on radical trolley beam.

Shunk *Snow Plow and Ice Removal* **BLADES**

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS

Various widths, lengths, thicknesses--flat or curved--standard or special--punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE

Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

Shunk

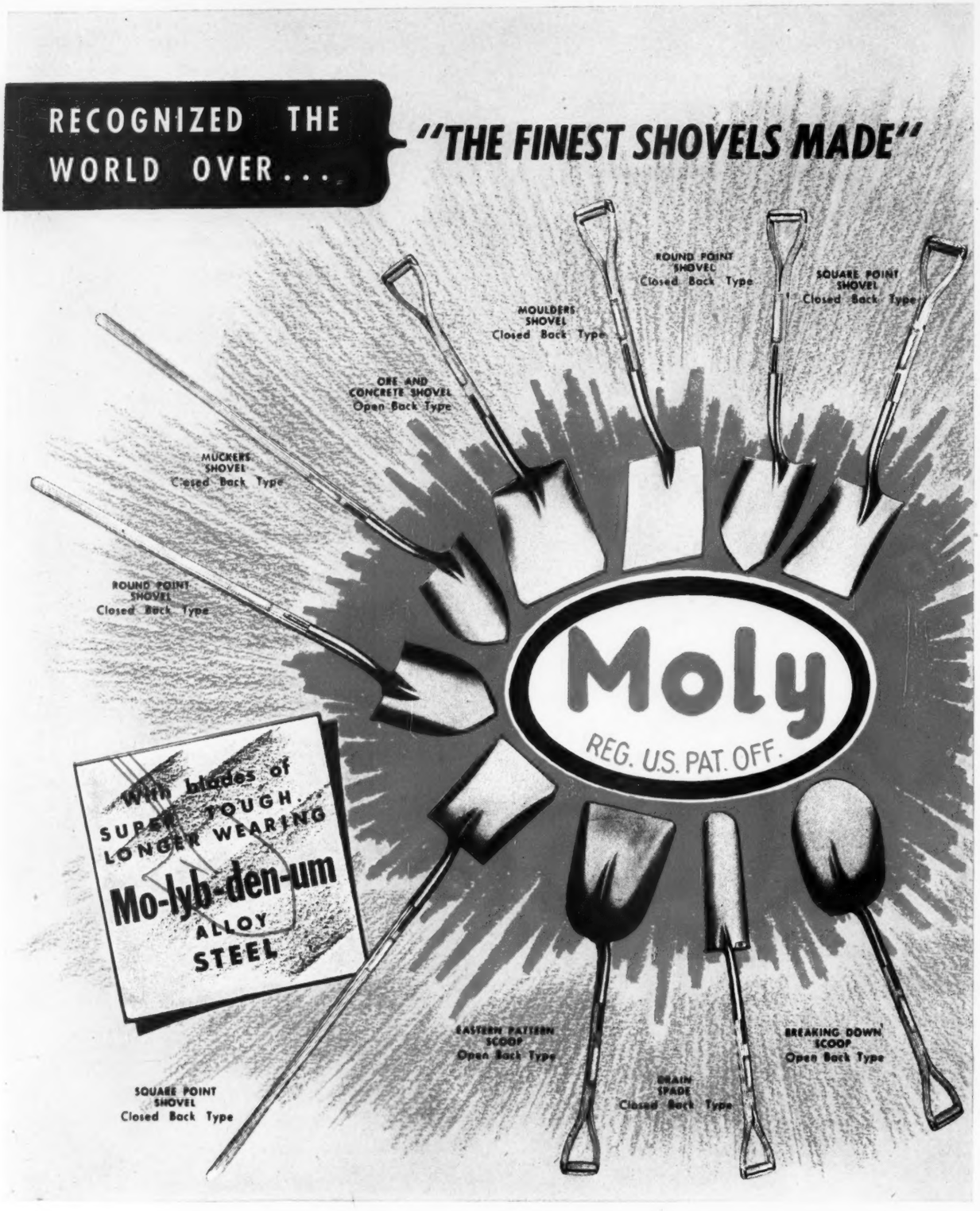
MANUFACTURING COMPANY

ESTABLISHED 1854

BUCYRUS, OHIO,

Through the war years, the cost of the job was secondary to *getting that job done.* But from now on, COST—both operating and maintenance—will be the all-important factor in the purchase of new heavy-duty earth moving and material handling equipment. When it comes to deciding what kind of power will operate that equipment at lowest cost, don't overlook the proved-on-the-job advantages of high-speed Cummins Dependable Diesels . . . their demonstrated reliability and long life . . . their easy, economical maintenance and service . . . their high horsepower output per pound of engine weight. Models for all types of power applications . . . automotive, portable or stationary . . . 50 to 275 hp.

CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana


RECOGNIZED THE WORLD OVER...
"THE FINEST SHOVELS MADE"
ROUND POINT SHOVEL Closed Back Type
SQUARE POINT SHOVEL Closed Back Type
MOULDERS SHOVEL Closed Back Type
ORE AND CONCRETE SHOVEL Open Back Type
MUCKERS SHOVEL Closed Back Type
ROUND POINT SHOVEL Closed Back Type
Moly
REG. U.S. PAT. OFF.
With blades of SUPER TOUGH LONGER WEARING
Mo-lyb-den-um ALLOY STEEL
EASTERN PATTERN SCOOP Open Back Type
BREAKING DOWN SCOOP Open Back Type
DRAIN SPADE Closed Back Type
SQUARE POINT SHOVEL Closed Back Type

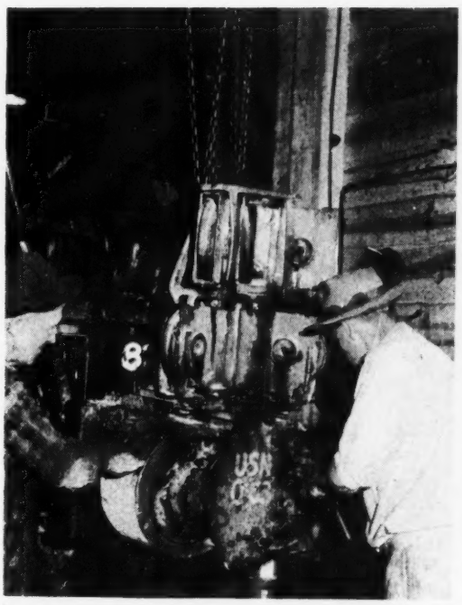
WOOD SHOVEL AND TOOL CO. PIQUA OHIO

A NATIONAL ORGANIZATION *SPECIALIZING EXCLUSIVELY* IN SHOVELS, SPADES AND SCOOPS

(Continued from page 138)

general superintendent of equipment for the WHMS combination was M. J. Crossett, assisted by C. C. Keckritz, superintendent of equipment. In the auotomotive shop, Walter J. Hammond was superintendent, and O. R. Ross was motor room foreman. The heavy equipment

TIRE RIMS are rebuilt by arc-welding with Lincoln gasoline-engine-driven welder in truck-mixer maintenance shop, pending provision of receptacles for operation of all-electric welding unit.



POWER CONTROL UNIT from rear end of D8 tractor is picked up by Coffing chain hoist for disassembly by mechanics in special section of heavy equipment shop reserved for work on these tractor winch attachments.

shop was under the immediate direction of Raymond R. Robinson, master mechanic. In the M. J. Boyle organization, under C. L. Sogge, general manager, R. B. Palmer was shop superintendent and F. H. Palmer was master mechanic.

THE NEW JACKSON GENERAL CONCRETE CONSTRUCTION VIBRATOR

EASIER TO HANDLE

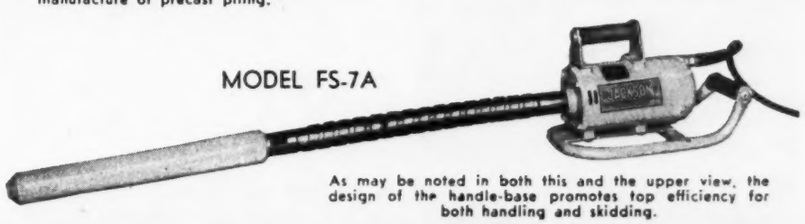
MORE POWERFUL

DOES THE WORK OF LARGER VIBRATORS

A JACKSON FS-7A Flexible Shaft Vibrator placing concrete in the manufacture of precast piling.

Here's unprecedented power in a lightweight, easy to handle electric vibrator, capable of operating vibrator heads as large as 2⅜" x 18⅝"; with flexible shafts up to 21' in length. Universal motor operates on 115 volt A.C. or D.C. and will deliver from 7000 to 10000 V.P.M. depending on the consistency of the concrete and the length of shaft used. It will take any of our standard flexible shaft vibrator heads: 2⅜" x 18⅝"; 1 1/16" x 16⅞"; 1 1/16" x 10¾", and may be had with shaft lengths of 24", 36", 7', 14', and 21'. It is, therefore, not only ideal for the thinner and smaller sections, but for the work previously done only by much larger vibrators, as well. It's truly a "general construction vibrator" — one that equips you to handle a great variety of jobs to best advantage — with only the price of one machine invested. Write for complete details.

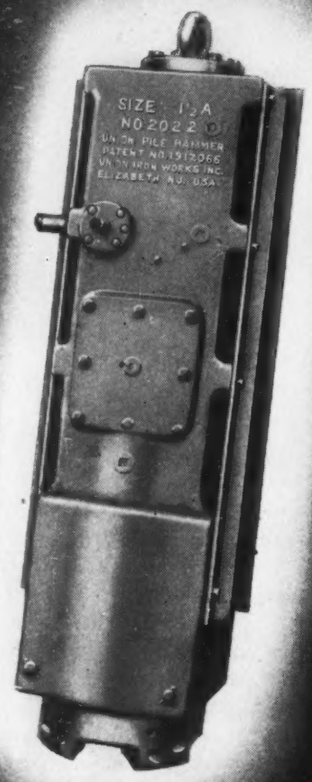
MODEL FS-7A



As may be noted in both this and the upper view, the design of the handle-base promotes top efficiency for both handling and skidding.

ELECTRIC TAMPER & EQUIPMENT CO. CADILLAC MICHIGAN

The All Purpose PILE HAMMER



WHATEVER your pile driving demands may be, there is a Union Pile Hammer to fill your requirements. Patented bases drive all types of piling efficiently. Write for catalog No. 184.

UNION IRON WORKS
INCORPORATED
Established 1900
ELIZABETH B NEW JERSEY
Export Office - 50 Church St. New York 7, N. Y.
Cable Address Brosites

ROCK BODIES AND TWIN-ARM HOIST UNITS, developed during the war for post-war activities, were used on a fleet of twelve heavy-duty trucks which moved 480,000 tons of rock and other excavated materials over difficult terrain in less than six months for a 372,000 mileage record at Grand Coulee Dam. These new units are being used for channel improvement and bank protection operations below the huge structure. They are

loaded by power shovels, climb 550 ft. to top of dam, traverse its 4,300-ft. length and travel upstream to dump their 23-ton loads wherever fill is needed. Heil rock body is 14 ft. in length overall, 90 in. in width (front-inside), 96 in. (rear-inside). Capacity (crown load) 11 yd. Body is of box-brace construction, ½ in. shell, 4-in. wear plate with a 2-in. oak cushion floor.—**The Heil Co., 3,000 West Montana St., Milwaukee, Wis.**

Steam-Detergent Cleaning

Want a fast, low-cost way to remove grease and muck from equipment to be repaired or overhauled? Then use rapid-acting Oakite steam-detergent cleaning. This time-saving technique does the job thoroughly. . . . QUICKLY removes caked-on oil, grease and muck. And if repainting is required, steam-detergent stripping with a special Oakite material EASILY removes old paint . . . leaves surfaces in perfect condition for the new paint coat. FREE 24-page manual gives details.

OAKITE PRODUCTS, INC.
24G Thames Street, New York 6, N. Y
Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE *Specialized* **CLEANING**
MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

Worthington-Ransome Blue Brute Distributors

By referring to the advertisement on page 143, you'll learn the meaning of the (1), (2) or (1-2) beside their names.

Ala., Birmingham (1-2) J. D. Pittman Tractor Co.
Ariz., Phoenix (2) Smith Booth Usher Co.
Ariz., Phoenix (1) Lee Redman Co.
Ark., Fort Smith (2) R. A. Young & Co.
Little Rock (1) Kern-Limerick, Inc.
Little Rock (2) R. A. Young & Son
Calif., Los Angeles (1) Garlinghouse Bros.
Los Angeles (1-2) Smith Booth Usher Co.
San Francisco (2) Coast Equipment Co.
Colo., Denver (2) John N. Meade
Denver (1-2) Power Equipment Co.
Conn., Hartford (2) The Holmes-Talcott Co.
New Haven (1) W. I. Clark
Waterbury (1) Contractors Supply Co.
D. C., Washington (1) M. A. Doetsch Machinery Co.
Fla., Orlando (1-2) High Equip. & Supply Co.
Miami (1-2) Allied Equipment, Inc.
Fla., Tampa (1-2) Epperson & Co.
Ga., Atlanta (1-2) Tractor & Machinery Co.
Savannah (1) Morgans, Inc.
Ida., Boise (1-2) Olson Manufacturing Co.
Ill., Chicago (1-2) Chicago Construction Equipment Co.
Chicago (2) John A. Roche
Chicago (1) Thomas Hoist Co.
Ind., Fort Wayne (1) American Steel Supply Co.
Indianapolis (2) Reid-Holcomb Co.
Iowa, Des Moines (2) Electric Eng. & Const. Co.
Ky., Harlan (2) Hall Equipment Sales Co.
Louisville (2) T. C. Coleman & Son
Louisville (2) Williams Tractor Co.
Paducah (1) Henry A. Petter Supply Co.
La., New Orleans (1) Ole K. Olson Co.
New Orleans (2) Wm. F. Surgi Equipment Co.
Maine, Portland (1-2) Maine Truck-Tractor Co.
Md., Baltimore (1) Stuart M. Christhilf & Co.
Baltimore (2) D. C. Elphinstone, Inc.
Mass., Boston, Allston (1-2) Clark-Wilcox Co.
Cambridge (2) Field Mach. Co.
Mich., Detroit (1) T. G. Abrams
Detroit (2) W. H. Anderson Co., Inc.
Dearborn (2) Thomas G. Abrams
Flint (2) Gransden-Hall & Co.
Muskegon (1-2) Lakeshore Machinery & Supply Co.
Minn., Minneapolis (1-2) Phillippi-Murphy Equipt. Co.
St. Paul (2) D. L. O'Brien
Miss., Jackson (1) Jackson Road Equipment Co.
Mo., Clayton (1-2) The Howard Corporation
Kansas City (1) Brown-Strauss Corp.
Kansas City (2) Machinery & Supplies Co.
St. Louis (2) W. H. Reaves
Montana, Billings (1-2) Interstate Truck & Equip. Co.
Montana, Helena (1-2) Caird Eng. Works
Neb., Lincoln (1) Highway Equipment & Supply Co.
N. J., Hillside (2) P. A. Drobach
Newark (1) Johnson & Dealaman
North Bergen (2) American Air Compressor Corp.
N. M., Albuquerque (2) Bud Fisher Co.
Roswell (2) Smith Machinery Co.
N. Y., Albany (1-2) Milton-Hale Machinery Co.
Buffalo (2) Dow & Co., Inc.
New York (2) Air Compressor Rental & Sales
New York (1-2) Hodge & Hammond, Inc.
New York (1-2) Railroad Materials Corporation
Olean (2) Freeborn Equipment Co.
N. C., Raleigh (2) Carolina Tractor & Equipment Co.
N. C., Raleigh (1) Smith Equipment Co.
N. D., Fargo (1-2) Smith Commercial Body Works, Inc.
O., Cincinnati (2) Finn Equipment Co.
Cleveland (2) S. M. Clancey
Cleveland (1) H. B. Fuller Equipment Co.
Cleveland (2) Gibson-Stewart Co.
Marietta (2) Northwest Supply & Equipment Co.
Toledo (2) M. W. Kilcorse & Co.
Okla., Oklahoma City (1-2) Townsco Equip. Co.
Oregon, Portland (2) Andrews Equipment Service
Pa., Allentown (2) H. N. Crowder, Jr., Inc.
Easton (2) Sears & Bowers
Harrisburg (2) Amer. Equip. Co.
Oil City (2) Freeborn Equipment Co.
Philadelphia (1) Giles & Ransome
Philadelphia (2) Metalweld Inc.
Pittsburgh (2) Atlas Equipment Corp.
Wilkes-Barre (2) Ensminger & Co.
Wilkinsburg (1) Arrow Supply Co.
S. C., Columbia (1-2) Smith Equipment Co.
Tenn., Knoxville (2) Wilson-Weesner-Wilkinson
Tenn., Knoxville (1-2) Dempster Bros., Inc.
Tex., Dallas (2) Shaw Equipment Co.
El Paso (2) Equipment Supply Co.
El Paso (1) Mine and Smelter Supply Co.
Houston (2) Dye Welding Supply Co.
Houston (1) McCall Tractor & Equipment Co.
San Antonio (2) Patten Machinery Co.
San Antonio (1) San Antonio Machine & Supply Co.
Utah, Salt Lake City (1-2) Landes Engineering Co.
Vt., Barre (1-2) A. M. Flanders, Inc.
Va., Richmond (1-2) Highway Machinery & Supply Co.
Wash., Seattle (2) Star Machinery Co.
Spokane (2) Andrews Equipment Service
W. Va., Charleston (1) Clyde P. Beckner, Inc.
Fairmont (2) Interstate Engineers & Constr., Inc.
Wisc., Milwaukee (1-2) Drott Tractor & Equip. Co., Inc.
Wyoming, Cheyenne (2) Wilson Equipment & Supply Co.

Buy Blue Brutes
Worthington Pump and Machinery Corp.
Worthington-Ransome Construction Equipment Division
Holyoke, Massachusetts

THIS "LIVE BOOM" PAVER LOWERS COSTS

Let's consider the unique advantages of the boom on a standard 34-E Ransome Blue Brute "Dual Drum" Paver to see why you can lay more yardage . . . more accurately . . . with less manpower . . . than with any other paver.

Because this boom is really a "live boom" just like your crawler crane, it can be power-elevated to allow 9 ft. clearance under the bucket. And the paver can be operated *continuously* with the boom in the elevated position.

Think what that means. Whenever you want, or as often as you want, you can concrete retaining walls, abutments, headwalls, etc. in one operation *at the same time you lay the slab.* You eliminate the extra expense of doing those operations separately.

Moreover, because this "live boom" *spreads as it swings* it covers wider area with each batch . . . cuts down on costly hand shoveling.

OTHER BLUE BRUTE PLUSSES

In addition, a Blue Brute "Dual Drum" Paver has the fastest-charging, self-cleaning skip . . . hydraulically-controlled bucket, eliminating split batches . . . metal-to-metal spiral cut-off for precise water measuring . . . mechanically-operated batchmeter for all-season accuracy. These and other features are described in detail in Bulletin 208. Write for it.

24R5-3

KNOW YOUR BLUE BRUTES

Your Blue Brute Distributor will gladly show you how Worthington-Ransome Blue Brute construction equipment will put your planning on a profitable basis and prove that *there's more worth in Worthington-Ransome.* Act now! His **name is listed on page 142. The number beside his name indicates the Blue Brutes he handles.**

1.
Blue Brutes include: Pavers, Concrete Spreaders**, Concrete Mixers, Concrete Placing Equipment, Big Mixers, Finishing Machines**, Pneumatic Placing & Grouting Equipment, Truck Mixers, Plaster & Bituminous Mixers, and accessories.

2.
Blue Brutes also include: Diesel, gasoline and electric driven Portable Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs; Rock Drills and Air Tools in a wide range of weights and sizes; Contractors' Pumps.**

**Postwar Products

BUY BLUE BRUTES

Truck Mixers
Capacities:
2, 3, 4½, 5½ cu. yds.

Portable Mixers
Capacities:
3½, 7, 10, 14 cu. ft.

Big Stationary Mixers
Capacities:
28, 56, 84, 126 cu. ft.

Pneumatic Placer
Capacity:
7, 14, 28 cu. ft.

WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division
Holyoke, Mass.

CONGRESS SAYS "GO"

TO THE CONSTRUCTION INDUSTRY

$3,000,000,000

NOW AVAILABLE FOR CONSTRUCTION WORK WITH THE PASSAGE OF THE FEDERAL-AID HIGHWAY ACT!

CONTRACTORS: Do you need financial backing to buy the machinery, engines and equipment needed to handle the work on which you will be asked to bid?

If so, C.I.T. will furnish the money . . . at LOW cost . . . and on long terms. Conserve your working capital by having C.I.T. finance your equipment purchases. Any amount, large or small, handled promptly. Be ready to bid on . . . and handle . . . all the work you can obtain!

ORDER the machinery and equipment you need NOW. Amortize the investment while completing your contracts . . . let the equipment earn money without tying up your operating capital. Combine several purchases, if desired, in one obligation.

Our nearest office will arrange all details or, tell your distributor that you want C.I.T. to finance the transaction. Use this liberal, easy-to-operate method of buying construction machinery and equipment.

The Mark of LEADERSHIP

C.I.T. CORPORATION

INDUSTRIAL FINANCING

OFFICES:

ONE PARK AVENUE,
NEW YORK 16, N. Y.

★

333 N. Michigan Avenue
CHICAGO 1, ILL.

★

660 Market Street
SAN FRANCISCO 4, CALIF.

★

In Canada:
CANADIAN ACCEPTANCE CORPORATION *Limited*
Metropolitan Building, Toronto

AFFILIATED WITH COMMERCIAL INVESTMENT TRUST INCORPORATED

HEIL Hi-Speed Cable Scrapers

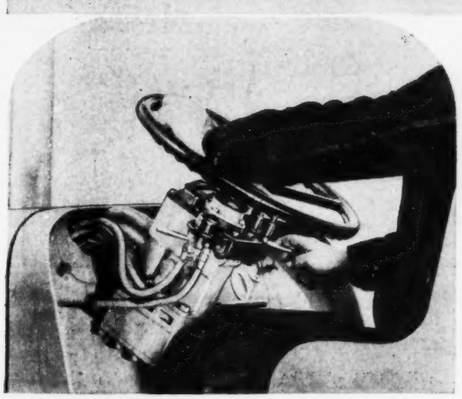
dig *capacity* loads.. faster..easier..without voids or waste

Correct Bowl Design

The size and shape of the bowl and front gate, plus the top forward slope of the back sheet, permits excellent boiling action.

. . . conforms with natural boiling action

The dirt has a tendency to boil into a mound-like load. The Heil bowl *fits* the load—without extra digging time or spillage due to forcing dirt into empty pockets at the rear.



Power-steer short-radius turn

Even in heavy going and over rough construction roads, the Heil Hi-Speed Tractor steers with the ease of the conventional passenger car. An engine-driven hydraulic pump furnishes steering power controlled by the steering head. The wheel is merely the hydraulic control-valve lever for the power steer. In addition, it can be operated manually to provide ample steering control in case of failure of the power system. Powerful in action, simple and reliable, this exclusive Hydro-power steer saves time and cuts driver fatigue

Because of its scientifically designed bowl and correctly pitched cutting blade, the famous Heil Hi-Speed Cable Dozer digs bigger payloads easier and faster. The bowl design conforms with the natural boiling action, forcing dirt into the entire bowl area without voids or waste. In addition, the rapid raising and lowering of the cutting bit, made possible by the fulcrum-type lift, forces all loose soil into the bowl—saving many valuable minutes out of each working hour.

Push-loaded with a crawler tractor, this unit digs a heaped 15-yard load in 40 to 50 seconds and speeds away to the fill at speeds up to 20 m.p.h.—to help you move more yardage, faster and cheaper. For further details—

See your Heil Distributor

R 53

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

The Novo Post-Hole Punch is the ideal unit for punching guard-rail post-holes! It is the latest accessory for the Novo Pavement Breaker.

200 guard-rail post-holes per 8-hour day is the average production of the Novo Pavement Breaker with Post-Hole Punch Attachment! It usually requires only three punches by this powerful machine to complete a hole ready for setting the post!

The Novo Post-Hole Punch is a 10" seamless-steel tube, 54" long! It replaces the standard Breaking-Nose on the Breaking-Hammer, using the same two "U" bolts. Its Stoodite-faced steel point provides positive penetration of surfaced shoulders and frozen ground! A collar, welded around the top of the point, cleans out holes on the up-stroke!

Safety dictates the use of plenty of highway guard-rails! Speed and economy dictate the use of the Novo Post-Hole Punch for setting guard-rail posts!

Bulletin No. 122 contains complete information on the Novo Post-Hole Punch, Bulletin No. 221 on the Novo Pavement Breaker. Send for either or both of these Bulletins!

Allied Member of A.E.D.

NOVO ENGINE CO.

On-the-Job TRAINING

(Continued from page 106)

Finally, he would propose methods for follow-up and evaluation. At first, the supervisors, wary of "long-haired" trainers they had encountered in the past, were skeptical. Their skepticism quickly melted, however.

Trainers Give Quick Treatments

The result was that Hanford's training program emerged as no ponderous "ivory tower" proposition. It was more like a fire department or an emergency inhalator squad that was kept constantly on the jump. Literally hundreds of training courses were designed and carried out. They were kept as records of performance, but hardly need to have been so kept. Most of them were one-shot propositions, meeting the major requirements of the non-repetitious construction industry. They were designed to meet specific needs.

An area superintendent telephoned the training department that his foremen were spoiling many time cards, thereby delaying checks to the men and raising his costs. A training analyst visited the area, observed the foremen cost coding their cards, spotted the few errors they were prone to make, and designed a training "quickly" of 10 min. for presentation at the area superintendent's next meeting. The errors almost completely disappeared.

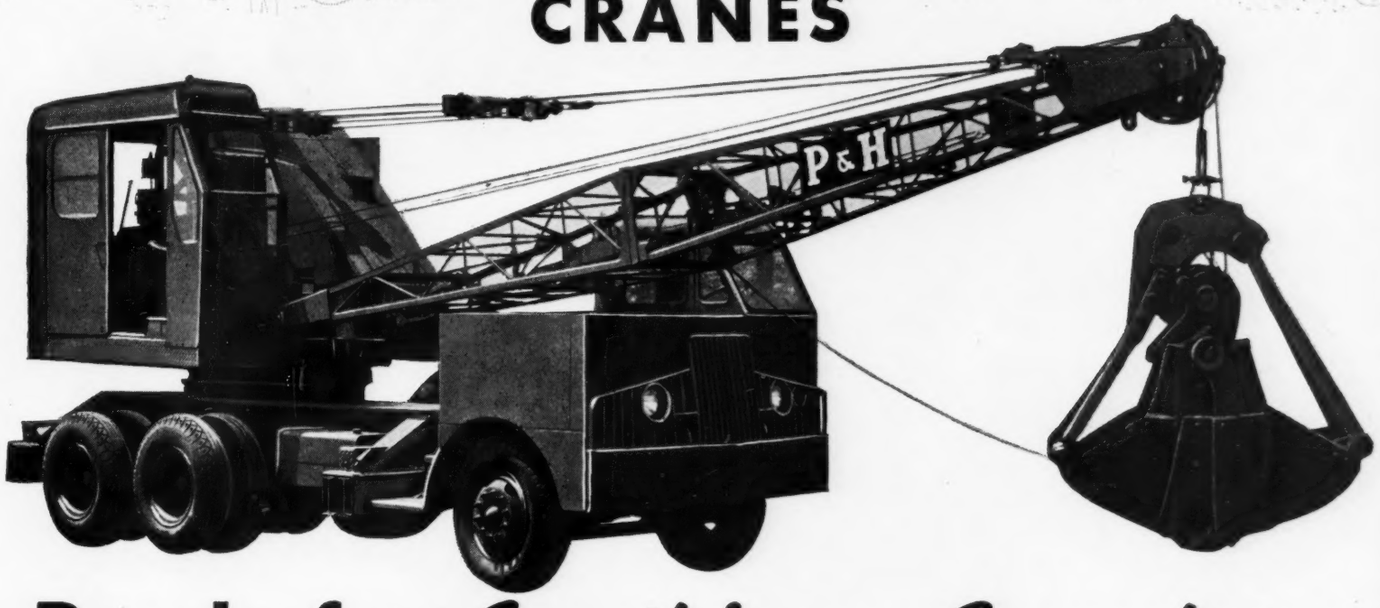
On the other hand, a personnel bottleneck developed when experienced millwrights could not be obtained. It was an ambitious assignment to undertake the training of craftsmen, but an intensive course of 54 hr. was designed, and it met the need. Another instance of more elaborate job training was occasioned when many welders failed the field tests on the exacting type of welding that was a characteristic of parts of the Hanford work. More than 300 welders were given 12 hr. training, and 202 immediately qualified, a great increase over the former record.

Refresher Course for Garage Men

Many of the auto mechanics who arrived on the job had been working in other fields, and had difficulty adjusting themselves to the varied equipment at Hanford. They were particularly deficient in knowledge of the functioning and repair of automotive ignition systems and carburetors. In one week 49 mechanics were boosted in "know how" to the level of expert mechanics. Written tests be-

(Continued on page 148)

P&H
TRUCK CRANES



Ready for *Anything...Anywhere*

Whatever you have to handle—with hook, sling, magnet, clamshell or single line bucket—P&H Truck Cranes make fast, easy work of it. And *wherever* it is—in the next block or the next county—they're "Johnny-on-the-Spot" with the ability to get quickly from place to place; through thick city traffic or over country roads. It's the kind of service that gets things done in a hurry —and cuts costs to the bone.

And here, too, you will find added values—exclusive operating advantages, such as:

Planetary Lowering—permits operator to "inch" loads accurately and safely, *under power!*

Planetary Boom Hoist—provides quick, safe raising and lowering of boom—*under power!*

Torsion-Bar Mounted Front Axles—provide greater stability—greater flexibility to handle all kinds of loads.

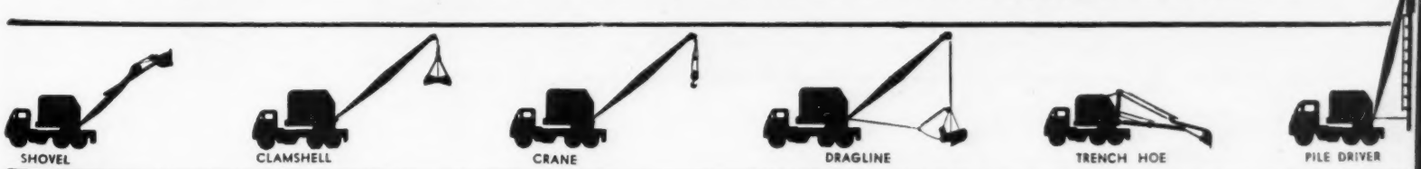
HydraulicControl—assures instant, positive response for easier, safer operation.

You'll find a great many other advantages in these outstanding P&H Truck Cranes—advantages that will save you time and money for years to come. All-welded construction of rolled alloy steels, for example, gives them greater strength to resist stresses and strains.

And you can bank on this: Size for size, no P&H Truck Crane has ever been outlifted. Why not get all the facts? Ask us to send you Bulletin TX-87.

General Offices:
4494 W. National Ave., Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION
EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS



These Renewable Lip Dippers are *Cutting Postwar Construction Costs*

Our illustration portrays the typically human impulse to stop and see a power shovel at work. The builders, in this case, made provision for the inevitable audience, which is watching the Lorain shovel, equipped with an Amsco Renewable Lip Dipper, moving the conglomerate material at a surprising rate.

Of course most of the "sidewalk superintendents" don't know that the dipper is made of manganese steel—a term confused in the minds of many of them with magnesium. Likewise some of them do not know the difference between a renewable lip dipper and the Big Dipper.

However, these values are well known by an ever growing host of power shovel owners, as is attested by the increasing use of Amsco Renewable Lip Dippers, which have proved the most economical on every kind of digging job.

Dippers of "the toughest steel known" give maximum life with minimum maintenance costs. Repeated impacts serve only to work-harden manganese steel, greatly increasing its resistance to abrasive wear. There is much less time out for repairs when Amsco dippers are employed.

With the Amsco Renewable Lip Dipper, it is unnecessary to scrap the entire front when the lip has become worn, and a new lip can be replaced on the job in a matter of minutes. Advanced design contributes to fast, full loading, and quick, clean dumping.

Amsco Renewable Lip Dippers are reducing costs on numerous postwar construction jobs. Send for details found in Bulletin 1143C.I. "Amsco Manganese Steel for the Construction Industry."

Worn parts can be restored with Amsco Conservation Welding Products. Ask for Bulletin 941-W.

AMSCO

Foundries at
Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; Oakland, Calif.; Los Angeles, Calif.; St. Louis, Mo.
Offices in Principal Cities

AMERICAN MANGANESE STEEL DIVISION
CHICAGO HEIGHTS • ILLINOIS

AMERICAN Brake Shoe COMPANY

LOOK to VIBER

for revolutionary new adaptions in concrete vibration

New equipment and uses...new higher speeds . . . greater interchangeability handy size . . . 3 kinds of power

VIBER
Concrete Vibrators

Keep ahead of schedule with Viber's newest "VIBER-ation" equipment!

VIBER COMPANY

726 South Flower Street
BURBANK, CALIFORNIA

(Continued from page 146)

fore and after the training revealed a 200-percent improvement.

When the first chill September mornings arrived, the utilities department was confronted with manning scores of boilers. Only 100 experienced firemen were found on the project. In three days a compact training course was designed, and in 6 hr. training each, 650 thoroughly proficient boilerhouse firemen were trained on the job. Hanford never experienced a boiler mishap.

In a single half-day midway through the job, the job training crew answered hurry-up requests for the following:

From a department superintendent for job relations training for a special group of supervisors in the control department.

From a section head for a training course to be given to advisers in preparation of income tax returns.

From a department superintendent for a comprehensive training program to be developed for automobile oilers.

From a department superintendent for a special training program to enable his foremen to improve the induction process for new men.

From a safety engineer for a train-

(Continued on page 150)

You'll Build Better, Faster, More Profitably with SKILSAW because

SKILSAW

saves time, man power, material handling!

• In spite of much talk about high building costs, SKILSAW's savings on every cut in construction enable you to bid lower on every job... handle more jobs, easily... make more profit on each one. Ask your distributor to demonstrate SKILSAW's speed, economy and dependability today!

SKILSAW, INC.
5033-43 Elston Ave., Chicago 30, Ill.
Factory Branches in All Principal Cities

PORTABLE ELECTRIC

SKILTOOLS

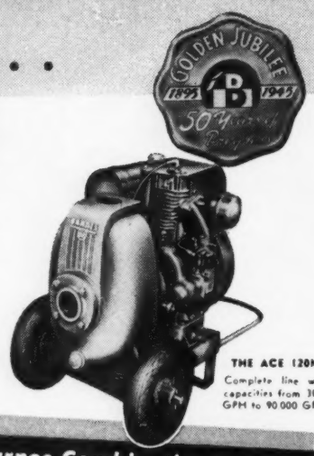
MADE BY SKILSAW, INC.

Look at BARNES AUTOMATICS *Before You Buy . . .*

The new Barnes Automatic Centrifugal Pumps — completely re-designed and stream-styled — incorporate advanced engineering design and features which place Barnes Pumps in a class by themselves for ruggedness, trouble-free performance, and capacities produced.

These outstandingly different and finer pumps give an entirely new conception of operation economy by handling more gallons of water for your pumping dollar. Look at Barnes before you buy.

For sale and in stock by leading distributors in all principal cities. If there is no distributor near you, write, phone, or wire



THE ACE (20M)
Complete line with capacities from 3000 GPM to 90,000 GPM

Barnes Combination of Top Performance Features

- Automatic Prime
- Leak-Proof Superseal
- Direct Suction Flow
- No Water Detours
- Non-Clogging Impeller
- Simplified Impeller Adjustment
- Heavy Duty Body
- Rigid Factory Tested

BARNES MANUFACTURING CO.
Quality Pump Manufacturers for 50 Years — MANSFIELD, OHIO

ARMY E NAVY

WELLMAN *Williams* BUCKETS
PERFORM BETTER *Longer*

Multiple Rope and Power Arm Types • Dragline • Power Wheel • Special Service Buckets • ⅜ to 16½ yd. capacities.

WELDED ROLLED STEEL CONSTRUCTION FOR LOWER MAINTENANCE, LONGER LIFE . . .

Formerly featured only in Wellman custom-built buckets — now in *every* Wellman-Williams Bucket.

Send for Bulletin

THE WELLMAN ENGINEERING CO.
7017 Central Avenue • Cleveland 4, Ohio
Sales and Service Agencies in Principal Cities

(Continued from page 148)

ing program to bolster foremen in an injury-ridden area.

Reducing Absenteeism

Training became the rational approach to many problems which had been attacked emotionally. Absenteeism had stubbornly refused to yield to repeated "morale" campaigns. In one week a special short course was given foremen in methods of absenteeism and turnover control. The foremen were taught ways to isolate the causes and spot the chronic offenders. The absenteeism average was cut in half, and turnover was materially reduced. This was classified as job training because it was approached from that vantage point, as the job of the foreman.

Training to Improve Skills

Methods training had a spectacular character. It covered all training directed toward improvement of working methods and skills. On-the-job it embraced job methods training in a specially adapted form for construction. Off the job it included hundreds of supplementary war production (vocational) training classes held at night, with the men gladly attending on their own time. All the crafts participated, and because the range of courses from which to choose was so broad, the craft committees selected courses which strengthened the "know-how" of the men in particular features of the Hanford job, most of which cannot yet be mentioned because of security.

Follow-up Evaluates Results

The follow-up stage of each training program was one of the most intensive and rewarding efforts of the entire activity. It took up where many industrial training efforts formerly had ended. The prime objective was to determine whether the worker actually used what he had been taught. And the training staff subscribed to the T.W.I. dictum that "if the worker hasn't learned, the instructor hasn't taught." Hence it was a continuing responsibility.

More than 3,000 foremen received the "packaged" courses of the T.W.I. program and they were specifically checked to see how much they retained from the sessions and put to use. Their follow-up men were members of their own crafts, specially trained to appraise the effect of the training. These men were introduced to the groups as their training came to an end, and within a week each trainee had been visited at his job by his follow-up man.

He was not certified as having successfully completed the training until he gave clear evidence of actually having

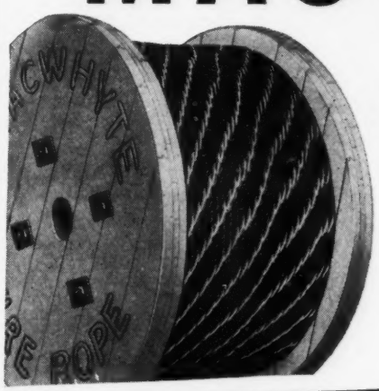
(Continued on page 152)

MACWHYTE

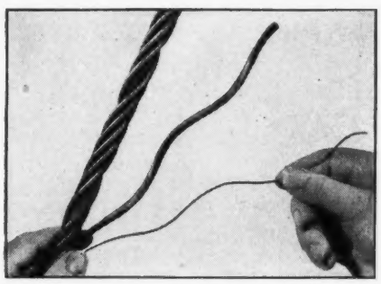
PREformed

INTERNALLY LUBRICATED

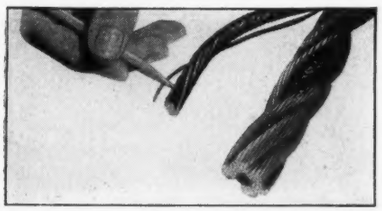
WIRE ROPE



For maximum safety, service, economy



All wires and strands in Macwhyte PREformed are spiral shaped to fit naturally into position. When you select Macwhyte PREformed you get "the correct rope for your equipment," plus a personal interest in helping you get the most out of your rope.



All Macwhyte PREformed is internally lubricated! Macwhyte Wire Rope Lubricant is packed around each wire in all strands. This improves the sliding action of the wires as they move in bending around sheaves and drums. It also protects against inside corrosion.

You make sure of the best when you buy Macwhyte PREformed. It's a rope with less internal fatigue, less friction, better balance and longer life. It's a safer, easier-to-use rope. These extra advantages are acquired through PREforming — every strand is shaped to take its place *naturally* in the rope. Internal stresses are held to a minimum.

The wire that goes into Macwhyte PREformed is processed under constant metallurgical control in Macwhyte's own wire mill. And when this tough, flexible wire is assembled into strands, PREformed and internally lubricated under close supervision of Macwhyte wire rope craftsmen, it just has to be the correct rope for your equipment.

Macwhyte PREformed is especially recommended for your extra-tough jobs, though many wire rope users tell us it pays them to specify this superior rope for all operations. They say its greater life makes it cost less in the long run.

Get this Macwhyte Wire Rope Catalog!

170 pages of useful information. A request on your company letterhead will bring it to you promptly. Ask for Catalog G-15.

MACWHYTE COMPANY

Wire Rope Manufacturers

2941 Fourteenth Avenue, Kenosha, Wisconsin

Mill Depots: New York • Pittsburgh • Chicago • Fort Worth • Portland • Seattle
San Francisco • Distributors throughout the U. S. A.

MACWHYTE PREformed and Internally Lubricated Wire Rope... MONARCH WHYTE STRAND Wire Rope ... MACWHYTE Special Traction Elevator Rope ... MACWHYTE Braided Wire Rope Slings ... MACWHYTE Aircraft Cables and Tie-Rods ... MACWHYTE Stainless Steel Wire Rope, Monel Metal Wire Rope, Galvanized Wire Rope 837-B

(Continued from page 150)

put it into practice. This was a pattern for the follow-up of every bit of training at Hanford, whether it was a quick one-shot approach or an elaborate program like the millwright training.

Analysis of Savings

Then careful evaluation was made to determine the actual savings. For example, it was found that each foreman spent about 2 hr. of his 9-hr. day giving instructions, or 23 percent of his time. The question was how much time did job instructor training save the project?

A careful analysis discovered that it saved about 20 percent of each foreman's training time, or nearly ½ hr. a day. It was easy to translate this into dollar savings, and the broad base of the analysis gave it great statistical validity.

There were interesting byproducts of such analyses. One of these was the discovery that, although the overall time required for instruction was cut down tremendously, about 13 percent of the foremen reported that they took more time for instructing after learning how to do it better. But they reported 38 percent less time spent by the workers in getting reinstructed. Thus, lifting the

(Continued on page 154)

CONTRACTORS RUBBER PRODUCTS

available from Stock for immediate Delivery

CONVEYOR, ELEVATOR and TRANSMISSION BELTING
all widths and plies

V-BELTS all sizes

HOSE
all sizes and types

AIR	DISCHARGE	STEAM
FUEL	COMPRESSOR	VACUUM
FIRE	PILE DRIVERS	SUCTION
WATER	ROAD BUILDERS	WELDING

BOOTS, DREDGE SLEEVES, PUMP DIAPHRAGMS, ETC.

. . . and everything rubber for Industrial Requirements

Write for new catalog

PHONE . . . . . WRITE . . . . . WIRE

CARLYLE RUBBER CO., Inc.

62-66 PARK PLACE NEW YORK 7, N. Y.

Phone: BArclay 7-9793

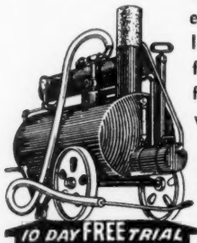
STEAM CLEANS FASTER

SIEBRING PORTABLE-OIL BURNING STEAM CLEANER

Saves Man Hours!

Cuts Repair Time!

Your repair shop or maintenance department can save many precious man-hours using the low cost, portable Siebring Steam Cleaner. Instant steam cleans faster and cuts repair time. It's automatic, burns fuel oil, natural or artificial gas. Its low cost will surprise you.



- *Portable, easy to move.*
- *Sturdy construction.*
- *Safe to use.*

10 DAY FREE TRIAL

You risk nothing. Sold on 10 day FREE TRIAL basis. Write for full details.

WRITE FOR FOLDER

Write today for complete and illustrated descriptive material on this remarkable steam cleaner. Address your inquiry to Dept. 700.

SIEBRING MANUFACTURING CO.-GEORGE IOWA

When the job takes POWER-

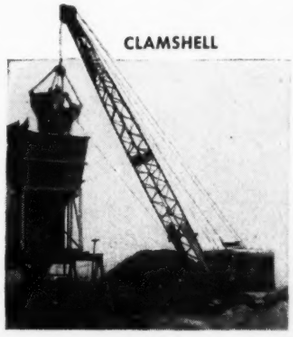
use a **LINK-BELT SPEEDER**

SERIES **300**

This big, powerful machine is fast and easy to handle, a combination that really piles up the tonnage! With Speed-O-Matic hydraulic control to give finger-tip operation, you get results without wearing down the operator. For more work per day — and more work per gallon — take a LINK-BELT SPEEDER Shovel-Crane-Dragline.

Quickly interchangeable for various special operations, your Link-Belt Speeder is the *first machine on the job, and the last to leave.* You get full return on your investment in a Link-Belt Speeder.

CLAMSHELL



CONCRETE BUCKET

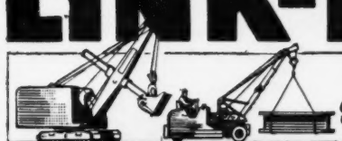
STEEL ERECTION

DRAGLINE

For Prompt, Efficient, Convenient Sales and Service:
There is a Link-Belt Speeder Distributor Located Near You

10,151

LINK-BELT SPEEDER



Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO 9, ILL.
(A DIVISION OF LINK-BELT COMPANY)

(Continued from page 152)

quality of the instruction paid indirect dividends. The amount of rework and spoiled material also was carefully analyzed and found to be much reduced.

Every training activity, no matter how small, was subjected to this searching type of cost analysis. The ratio of the training cost to the entire cost of the job was monitored every step of the way, and it ended at approximately one-fourth of 1 percent of the total project cost. Its actually tabulated savings, ignoring the many intangibles and certain qualitative measures, amounted to more than 400 percent, compared with its own cost.

Training as a Construction Tool

Although the peak force at Hanford was 45,000, actually more than 125,000 construction workers engaged in the great task at one time or another. With such a large participating audience for one of the most rewarding uses of industrial training on record, it seems probable that there will be diffused throughout the industry a new respect for training as a practical tool of construction.

However, it seems equally certain that training, as the construction industry

• (Continued on page 156)

Literally, Immersion Curing when you Cure with SISALKRAFT

WHEN you cure concrete with Sisalkraft, the water in the original mix is held in the slab. This assures a hard, dense slab, extremely resistant to wearing and cracking.

Sisalkraft protects as it cures. No grinding or scraping of drippings caused by pourings from above. In addition, the Sisalkraft is easily and quickly removed.

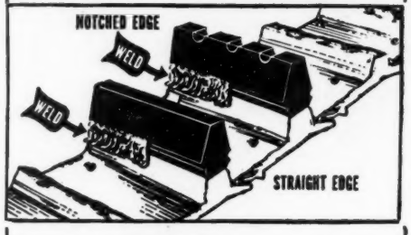
Sisalkraft curing is recognized by construction engineers as the ideal method for curing concrete. "Cash in" on its labor and time saving advantages on your next job.

Two layers of asphalt make SISALKRAFT waterproof. Lengthwise and crosswise fibre reenforcement imparts amazing strength with flexibility! Two layers of high wet strength kraft paper seal in the asphalt, preventing it from drying out. SISALKRAFT is a processed product — the result of scientific research.

THE SISALKRAFT CO.
205 W. WACKER DRIVE · CHICAGO 6, ILL.
NEW YORK · SAN FRANCISCO · LONDON · SYDNEY
In Canada Write to Alexander Murray & Co., Limited at Montreal · Toronto · Halifax · Saint John · Winnipeg · Vancouver

Manufacturers of SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

Rebuild your TRACTOR GROUSERS WITH BULLDOG Grip-Lugs



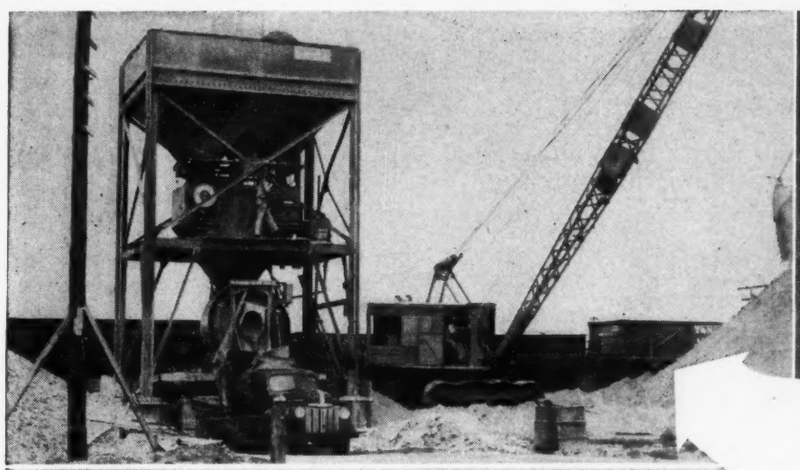
Easily Welded
ECONOMICAL
GIVES MORE
PULLING POWER

See your local Equipment Dealer

Send for Folder CM

ALLIED STEEL PRODUCTS, Inc.
7835 Broadway
CLEVELAND 5 OHIO, U. S. A.

"With Gulf Quality Lubricants and Fuels we get *better performance* from equipment, lower maintenance costs"



says Superintendent Ed Strickler

*R. P. Farnsworth & Company, Inc., Houston, Texas, have the contract to widen over 20 miles of U. S. Highway 290 between Eureka and Cypress, Harris County, Texas. This contractor has used Gulf quality lubricants and fuels exclusively for over 15 years.

"I AM PARTIAL TO GULF PRODUCTS because they help me get maximum performance from every piece of equipment—the kind of performance that's needed to meet finish dates on our contracts," says Superintendent Ed Strickler of R. P. Farnsworth & Company, Inc.* "With Gulf lubricants and fuels we get good gas mileage and very low maintenance costs. Besides, I can always depend on the prompt delivery of every Gulf order."

During the past few years, there has been little allowance in contracts for breakdowns and delays due to mechanical troubles. That's why leading contractors have formed the habit of using Gulf quality lubricants and fuels as basic job insurance. They know that Gulf products help effectively to keep equipment on the job—and maintenance costs at rock-bottom levels.

Call in a Gulf Service Engineer before you start your next job—he will help you complete it more quickly and at a larger profit. Write, wire, or phone your nearest Gulf office today.

GULF

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

When Manpower is Not Available

HOISTPOWER

WILL DO THE JOB FOR YOU

COFFING

SAFETY-PULL Ratchet Lever Hoists

MODEL Y-C Spur Geared Hoists

QUIK-LIFT Electric Hoists

Each is a quality product designed to give long service and speed up production, construction, materials handling and maintenance problems. For descriptive literature contact your supply house or write for Bulletin D-4.

Coffing Hoist Co.

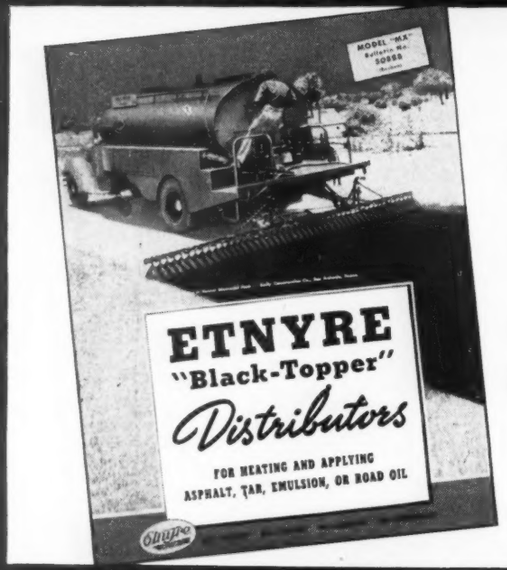
MANUFACTURER OF QUALITY PRODUCTS

DANVILLE, ILLINOIS

ETNYRE

"Black-Topper"

BITUMINOUS DISTRIBUTORS



SEND FOR FREE BULLETIN No. 508 BB

E. D. ETNYRE & CO., Oregon, Illinois

(Continued from page 154)

evolved it under forced draft at Hanford, will be an instrument tailored especially to its needs, placing great stress on job training and the concept that training must be a light and manageable tool which can be brought to bear on problems, great or small, with a minimum of ceremony and waste motion.

★ ★ ★

Chemical Injections

(Continued from page 79)

Philadelphia Quartz Co. and the Solvay Sales Corp.

Unit cost of soil solidification varies according to depth of injection, accessibility and other factors dependent on the location, but only in extremely difficult applications does it exceed the cost of good reinforced concrete. Soil solidification experts strongly advise that concrete be used wherever possible and that soil solidification be considered where concrete does not meet the needs.

Application of Process

For the Clewiston, Fla., foundation work, a total of 27 groups of injection pipes, with a horizontal spacing of 26 in. between groups, was used, giving an overall distance of slightly more than 50 ft. between the two end groups. Preliminary soil tests had revealed a sand of grain size ranging from about No. 42 to No. 80, U. S. sieves. The concrete foundation mat under the mill engine and crusher was 10 ft. 8 in. thick. Injection of the chemicals into the subsoil below this mat was carried on from outside the mill building without disturbance to repair work being performed simultaneously inside. Presence of a service building just west of the mill building necessitated excavation of a trench 4 ft. deep by dragline to serve as a working pit from which pipes could be driven at angles close to the horizontal.

As the pipes were installed by driving and not by jetting, no loss of ground resulted. Driving equipment consisted of air hammers, hydraulic pipe pushers and a drop hammer outfit for pipes which went down at angles greater than 45 deg. with the horizontal. Two compressors, interconnected, furnished 210 cfm. of air for all pneumatic tools and the chemical pumps. Withdrawal of the pipes from the solidified soil was accomplished by a specially developed twin-hydraulic jack-

(Continued on page 158)

How Timken Axle Service has helped operators of over 500,000 Vehicles

● In thousands of on-the-job contacts, and in 1704 group meetings, Timken Axle Regional Representatives have performed a vital service for operators of more than 500,000 vehicles. They have demonstrated the benefits of proper maintenance, encouraged more intelligent vehicle selection and use, and given timely tips on how to keep 'em rolling.

This part of Timken Axle's established overall program insures better performance and cuts maintenance cost. It is a service freely given by us to operators, vehicle manufacturers, factory branches and dealers.

You can benefit, too

When buying new vehicles: (1) Analyze the job each vehicle must do; (2) Study specifications and buy your vehicle to fit your job; (3) Protect your investment by good maintenance and careful operation. If you do these three things, you're bound to benefit in overall operating efficiency.

Manufacturers will be ready soon with new vehicles. Timken will be ready, too, with the finest line of axles incorporating the greatest advances in the history of the axle industry.

Ask about axles when you buy. Be sure you get Timken Axles.

TIMKEN AXLES

TIMKEN AXLES

THE TIMKEN-DETROIT AXLE COMPANY, DETROIT 32, MICH.
WISCONSIN AXLE DIVISION • OSHKOSH, WISCONSIN

For general measuring work the Lufkin X-46 Folding wood Rule is almost as handy as an extra pair of hands. Made of selected hardwood, finished in light color which makes perfect background for black, prominent markings. Brass extension slide permits inside measurement. For a handy, durable folding wood rule, buy the Lufkin X-46 from your dealer. Write for free catalog. THE LUFKIN RULE CO., SAGINAW, MICHIGAN, New York City.

LUFKIN FOR DEPENDABILITY

Continuous steel tubing — more readily available than wood under today's conditions — has been a vital factor in STERLING'S reputation for quality and performance. The TUBULAR FRAME, reinforced to give additional strength at points where stress and strain are greatest, fortifies your STERLING Wheelbarrow for tough use and hard punishment under every condition. So, be sure to specify the STERLING tubular framed barrows on your next order.

Note: Deliveries of Sterling Wheelbarrows are being stepped up as rapidly as improvement in the raw material situation permits.

STERLING WHEELBARROW CO., Milwaukee 14, Wis.

Look for this Mark of STERLING Quality

Sterling WHEELBARROWS

(Continued from page 156)

ing outfit which previously had given excellent service on another deep-injection soil treatment job.

Injection started with the lowest pipes in the various groups and proceeded upwards, thus providing an impenetrable base for the injection from each succeeding pipe. In this way the pumped-in chemicals were confined and compressed into the space between the layers just solidified and the bottom of the existing concrete above, filling all the voids. When the top layer was reached, near the concrete, it was found that the spacing of the pipes had been too conservative. Because the chemicals had been carried by groundwater farther than expected, they had penetrated beyond the theoretical limits and had solidified prac-

TEST INJECTION at site is made with portable, battery-driven pump outfit. Groundwater at this spot is 10 in. below grade, and test injection is being made to about 5 ft. below grade.

tically all of the soil immediately under the concrete foundation, thus making it possible to eliminate most of the last row of pipes and save a substantial amount of chemical.

To be sure that no area had missed impregnation, fifteen additional pipes were attempted, spaced at points between the last pipes driven and injected. Only a few of the fifteen could be forced part way into the soil, after hard and persistent driving.

Extent of Solidification

As the work approached completion, a test hole 3x7 ft. in area was excavated at a spot selected by the owner and a representative of Moran, Proctor, Freeman & Mueser, consulting engineers. The excavation disclosed the fact that the

(Continued on page 160)

Cuts Sewage Carrying Costs— ALL ALONG THE LINE!

LOWER handling costs . . . faster assembly . . . less infiltration . . . high carrying capacity . . . these are some of the ways Transite Sewer Pipe provides important economies *all along the line*—in handling, installation and performance!

And here are the reasons why:

Long lengths, light weight. Transite Sewer Pipe is made in long 13-foot lengths. That means fewer joints . . . more footage per day. Its light weight also speeds up installation, reduces handling costs.

Tight sleeve-type joints. To guard against costly infiltration and keep down the load at the disposal plant, Transite has a sleeve-type joint combining flexibility with tightness. Easily assembled, *stays* tight in service.

Smooth interior surface. An advantage that assures high carrying capacity (Kutter's n=0.010). This frequently permits the use of smaller pipe, or flatter grades with shallower trenches.

An asbestos-cement product. Made of asbestos and cement compressed into a tough, dense, homogeneous structure, Transite Sewer Pipe is strong, durable and highly resistant to destructive agencies underground. Its efficiency and economy has been proved through the years under a wide range of service conditions.

If your plans include sewage works improvements, write for Brochure TR-21A which gives the facts about Transite Sewer Pipe. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

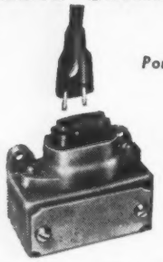
JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE *SEWER* PIPE

FOR EFFICIENT, ECONOMICAL SEWAGE DISPOSAL

MINES

Cable Connectors



For Power Transmission

Single or Multi-Conductor

Heavy Duty

Water Sealed

Molded Rubber or Synthetic

Can Be Molded at Factory to Specifications on Your Cords or Cables

Stand Rough Handling and Difficult Conditions

Capacities from 5 to 500 Amperes

Voltages Up to 5000

Carried in Stock in Standard Designs and Sizes and Can Be Made Up Special to Meet Your Specific Requirements.

Write for Bulletin MC-106, showing many successful applications of Mines Connectors throughout industry.

MINES EQUIPMENT COMPANY

4245 Clayton Avenue
St. Louis 10, Missouri

(Continued from page 158)

top of the solidified mass was about 18 in. above the upper limits of the area under contract for solidification, verifying the belief that the last row of pipes directly under the existing concrete had a radius of action sufficient to reach beyond the foundation.

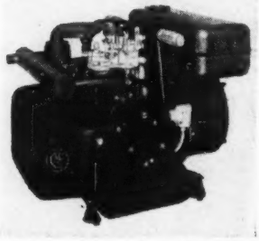
Work was completed within the stipulated time limit. In 43 working days the contractor drove and pulled a total of 6,564 ft. of injection pipe. While the pipe was being driven, a total of almost 22,900 gal. of chemical No. 1 was injected. Similarly, while the pipes were being withdrawn, the contractor injected through them 16,641 gal. of chemical No. 2. For the total working period of 43 days, the average daily injection was 920 gal. of chemical and the mass of soil solidified was about 660 cu. yd. The unit cost of about $23 per cu. yd. for soil solidification was below the estimate submitted before the job started under a force-account contract.

Since the subsoil under the foundation was solidified, exact level readings have been taken by the engineering department of the U. S. Sugar Corp. over a period of more than 1½ yr. These readings show no additional settlement of the

(Continued on page 162)

MC ELECTRIC Generating PLANTS

350 to 35,000 WATTS - AC or DC

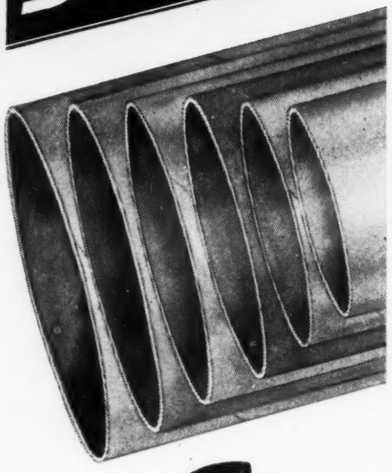


Reliable, practical and low cost. Available in all sizes. Portable, self-contained, inherently regulated generator. Write for details

CONSTRUCTION MACH'Y CO.
WATERLOO, IOWA

MIXERS . . . PUMPS . . . HOISTS BATCHING & PLACING EQUIPMENT . . . SAWS!

SAVE with Sonotube



Save Lumber Time Labor Money

Ready to pour *concrete* Pier and *Column Forms*—Laminated fibre tubing practical for piers up to 7′ and columns up to 10′.

6 Standard Sizes
Up to Twenty-Four Feet Long

INSIDE DIAMETER					
8″	9″	10″	11¼″	12″	13½″
SQUARE INCHES					
50.26	64	78.54	100	113.1	144

Smaller sizes available.

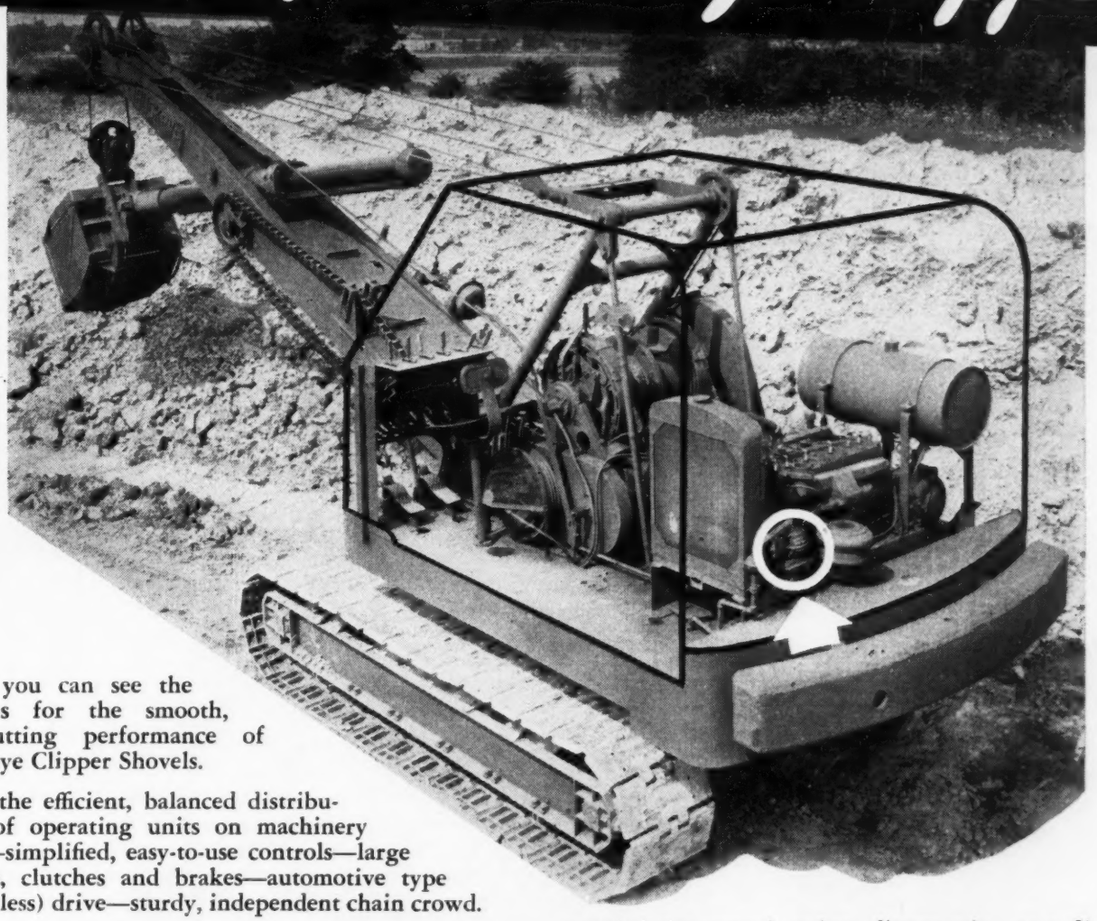
Cut to Lengths on Job

IMMEDIATE DELIVERY

Write for Delivered Prices

SONOCO PRODUCTS COMPANY
HARTSVILLE, S. C. MYSTIC, CONN.
ROCKINGHAM, N. C. GARWOOD, N. J. LOWELL, MASS.

X-RAY of a Buckeye Clipper



Here you can see the reasons for the smooth, cost-cutting performance of Buckeye Clipper Shovels.

Note the efficient, balanced distribution of operating units on machinery deck—simplified, easy-to-use controls—large drums, clutches and brakes—automotive type (chainless) drive—sturdy, independent chain crowd.

Circled is the vacuum pump, heart of the "Mevac"—metered vacuum control system. This system—similar to those used for years on highway trucks and trailers—provides fast, positive, responsive operation of clutches and brakes that control all the shovel's functions—travel, hoist, crowd, swing, dipper trip—at a flick of the operator's wrist.

Send for your copy of "Age of the Clippers" and learn how these rugged, easy-to-operate shovels can help you cut costs on today's competitive jobs.

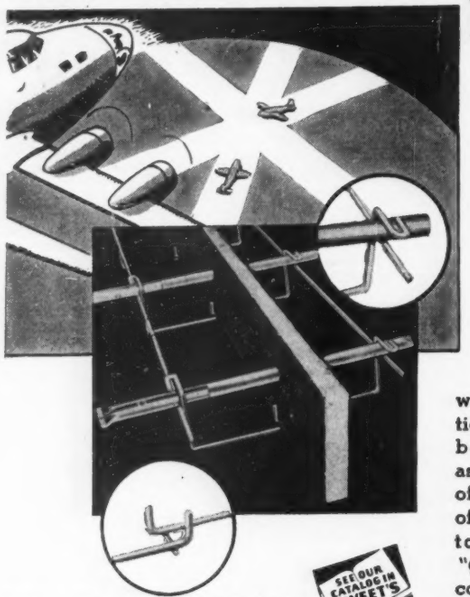
QUICKLY CONVERTIBLE FROM SHOVEL TO TRENCH HOE OR DRAGLINE.

Built by Buckeye

Buckeye Traction Ditcher Co., Findlay, Ohio

Convertible Shovels | Trenchers | Tractor Equipment | Road Wideners | R-B Finegraders | Spreaders

Build Better Runways Faster with "QUIK-LOCK"



Expansion Joint Assemblies

Because of the many advantages of *"QUIK-LOCK"* Expansion Joint Assemblies, they are widely used to speed up the construction of airplane runways and assure better jobs. Their special design assures easy positioning and locking of dowels, and accurate positioning of dowels parallel to each other and to the subgrade. Find out how *"QUIK-LOCKS"* can speed your construction and provide better joints at smaller cost.

SEE OUR CATALOG IN SWEET'S

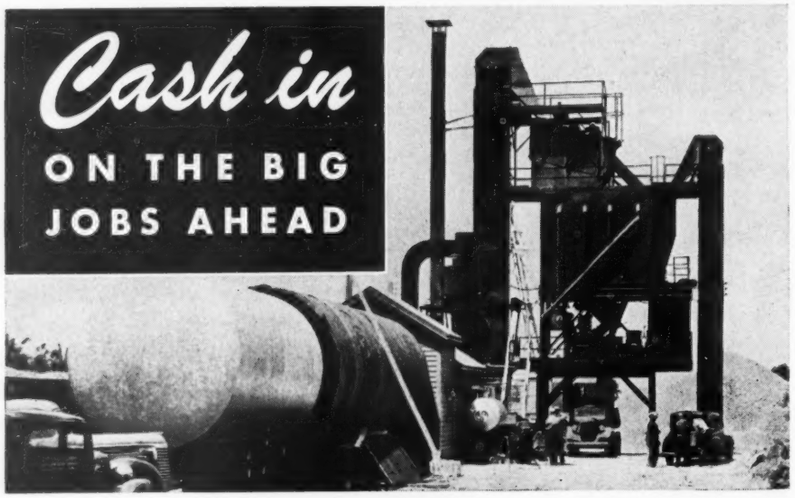
Today . . . Write for Union Steel Products Catalog of Construction Accessories.

UNION STEEL PRODUCTS COMPANY
439 Pine Street, ALBION, Michigan

CONCRETE & BUILDING SPECIALTIES, LTD.
3334 Danforth Avenue, Toronto, Canada

WILLIAMS WALLACE COMPANY
100 Hooper Street, San Francisco, Calif.

Cash in ON THE BIG JOBS AHEAD



WITH THIS PORTABLE, ALL-ELECTRIC ASPHALT PLANT

H&B ESTABLISHED 1867

Manufacturers of Portable and Stationary Asphalt plants of all types and capacities.

This rugged, all-electric plant will give you the volume, uniformity and economy of production that will be needed in meeting competition on the big jobs ahead. Sectional-type construction makes for quick assembly and disassembly, and easy portability. All units driven by individual motors, and completely wired at our plant. New horizontal type dust collector and larger fan make for greater compactness and efficiency. Write for specifications and complete information.

HETHERINGTON & BERNER INC.
735 KENTUCKY AVENUE • INDIANAPOLIS 7, INDIANA

(Continued from page 160)

foundation above the solidified area, although heavy, vibrating crusher machinery has been working 24 hr. a day during most of that time.

Various important improvements of injection equipment and high-pressure connections have been made since completion of the Clewiston job, on the basis of two years' experience in deep-soil consolidation work. These improvements and other developments recently worked out are expected to reduce the unit cost of solidified soil to a level which will make the process a useful aid to the contractor who faces foundation and water troubles in wet sand.

★ ★ ★

Ingenious Pier Replacement

(Continued from page 101)

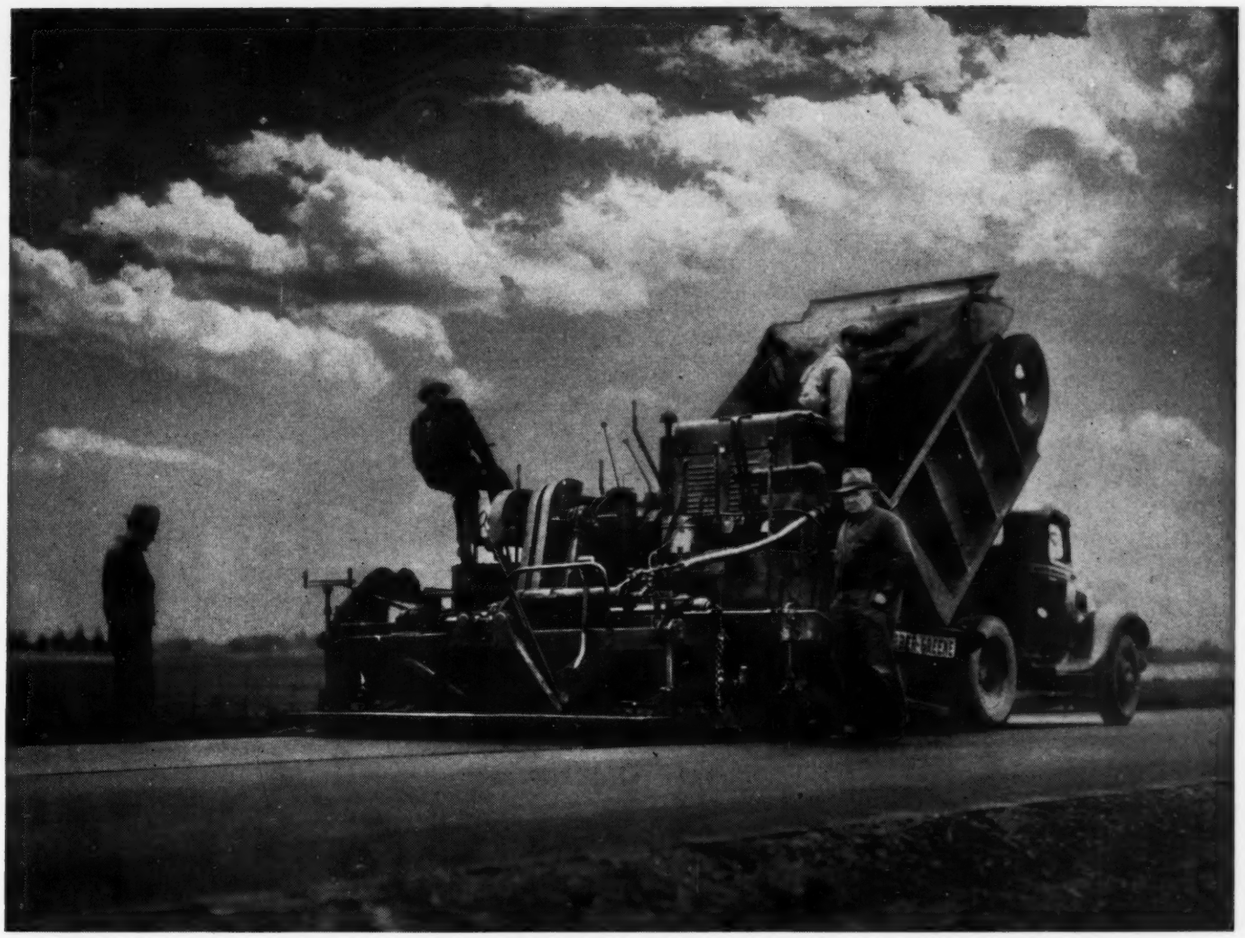
as-catch-can from local woodlots which did not produce good sticks of sufficient length for piles. Much material which normally would not be used had to be accepted as a substitute for hardwood. Delays in getting delivery on pipe and H-piles forced the piledriving into the winter months.

Extreme pressure finally brought about delivery of the lifting and supporting girders about January 1, 1944. All the lifting and girder work was performed in the dead of winter. Two feet of ice on the lake simplified work somewhat, but the extremely cold weather made working conditions uncomfortable. Lake level was unusually high throughout the fall and winter, and temporary pipe-pile caps had to be placed at a higher elevation than intended.

Additional Pier Settlement

In the midst of the operation, the pier settled another foot, to about 2.5 ft. below original elevation, and reversed its angle of tip toward the west. This settlement made it necessary to change the procedure, as insufficient clearance remained at the lifting girders to put the jacks in place on top of the pipe-pile caps. End floor beams over the pier were hastily reinforced, and the spans were jacked from the pier. The pier settled a few inches during the jacking operation but held up long enough to permit blocking up the lifting girders from their sup-

(Continued on page 164)



HOW A B G FINISHER MAKES SMOOTHER ROADS

Here's a way to get a well packed surface without springy spots. An asphalt mat laid down with a Barber-Greene Tamping-Leveling Finisher is smooth, *firm*.

In many cases, a 5-ton roller adds only about an eighth of an inch compaction to the material *tamped* by a Barber-Greene. What's more, depressions in the base are not reflected in the finished surface. *The mat is equally packed over every variation in the subgrade.*

Hammering the hot mix 1200 times a minute, the bevelled face of the tamping bar actually compacts the material while striking it off. And to produce a mat of uniform density, the compacted mix is pushed forward and downward simultaneously.

In addition, the creeping travel of the tamper imparts a rolling movement to the loose mix in the spreading chamber. This prevents segregation of the material. And the weight of the follow-up screed — level with the stroking depth of the tamping bar — completes compaction . . . leaves a smooth, table-top surface.

A Barber-Greene *Tamping-Leveling* Finisher will help you build better, smoother, lower-cost roads. Write for B-G Finisher Catalog. Barber-Greene Company, Aurora, Illinois.

The tamping bar on a Barber-Greene Finisher compacts the hot mix while striking it off. Material is pushed forward and downward at the same time to fill all the voids in an uneven subgrade. A mat of equal density throughout is produced.

45-4

Barber-Greene B G *Constant Flow Equipment*

(Continued from page 162)

ports. Placing of the concrete pier caps on the H-piles then progressed, the old pier was removed down to the ice line. and the permanent girder was jockeyed into place.

Corrections at Second Pier

About March 15, 1944, the structure had been safely established on the new piers and girder, and dismantling began. Pipe piles would not pull and had to be broken off with dynamite. The spans at the north pier were now higher than originally intended, and maintenance forces went to work to raise the spans at the south pier and produce a reasonable profile over the entire structure. The spans were raised at the south pier and were slid over a few inches to correct the alignment. Bearings were established on railroad rail grillages which were later concreted in.

Results of Operation

The entire operation was completed in July 1944. Today the salvaged bridge stands in perfect alignment and on a satisfactory profile. It is expected that the north pier and cross girder will serve for the remaining life of the structure.

This type of replacement pier has considerable merit, as it is adaptable to a

(Continued on page 166)

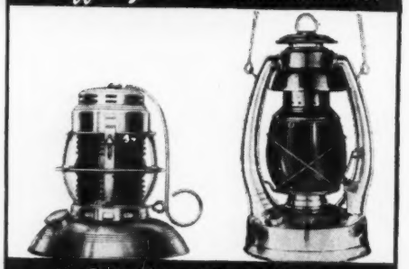
Here Is Your Nearest
VULCAN
DISTRIBUTOR
of Pile Driving
Hammers & Extractors

R. S. Armstrong & Bro., Atlanta, Georgia
Balzer Machinery Co., Portland, Oregon
Herman M. Brown Co., Des Moines, Iowa
Browning-Ferris Machinery Co., Dallas and Houston, Texas
Cameron & Barkley Co., Charleston, S. C.
W. I. Clark Co., New Haven, Connecticut
Coast Equipment Co., San Francisco, California
Contractors Machinery Co., Detroit and Grand Rapids, Michigan
Contractors Machinery Co., Kansas City, Missouri
A. H. Cox & Co., Seattle, Washington
Day & Maddock Co., Cleveland, Ohio
A. F. Deaney, Indianapolis, Indiana
J. E. Dilworth Co., Memphis, Tennessee
Dravo-Doyle Co., Pittsburgh, Pa.
Edward C. Flaherty Co., Long Island City, N. Y.
Galigher Company, Salt Lake City, Utah
General Supply & Equipment Co., Baltimore, Maryland
Harron, Rickard & McCone Co. of So. Calif, Los Angeles, Calif.
Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colorado
Honolulu Iron Works Co., Honolulu, T. H., and Manila, Philippine Islands
Hunter Tractor & Machinery Co., Milwaukee, Wisconsin
William T. Johnston Co., Cincinnati, Ohio
Llewellyn Machinery Co., Miami, Florida
Lorenz Equipment Co., Columbus, Ohio
T. S. McShane & Co., Omaha, Nebraska
Morgans, Incorporated, Savannah, Ga.
North Carolina Equipment Co., Raleigh, North Carolina
M. B. Ogden, Jacksonville, Florida
Perrin, Seaman & Co., Boston, Mass.
Henry A. Petter Supply Co., Paducah, Ky.
Phillips Machinery Co., Richmond, Va.
Howard W. Read Corp., Philadelphia, Pa.
Rupp Equipment Co., Buffalo, New York
Geo. F. Smith Co., St. Louis, Missouri
Stanley & Cadigan Co., Portland, Maine
West Virginia Tractor & Equipment Co., Charleston, West Virginia
Wilson Machinery Co., Lexington, Ky.
Wilson, Weesner, Wilkinson Co., Nashville and Knoxville, Tennessee
Woodward, Wight & Co., Ltd., New Orleans, Louisiana
Wylie-Stewart Machinery Co., Oklahoma City, Oklahoma
Young & Vann Supply Co., Birmingham, Alabama
Wm. H. Ziegler Co., Inc., Minneapolis and Duluth, Minnesota

VULCAN IRON WORKS Since 1852
331 North Bell Avenue
Chicago 12 ---Illinois

EMBURY
Dependable
WARNING LANTERNS

Traffic Gard LITTLE AIR PILOT



Order Through Your Jobber
EMBURY MFG. CO., WARSAW, N.Y.

ON-THE-SPOT MIXING
with a **JOHNSON**
PORTO-BATCHER

Mix Where Needed . . . Saves Time, Tires and Labor

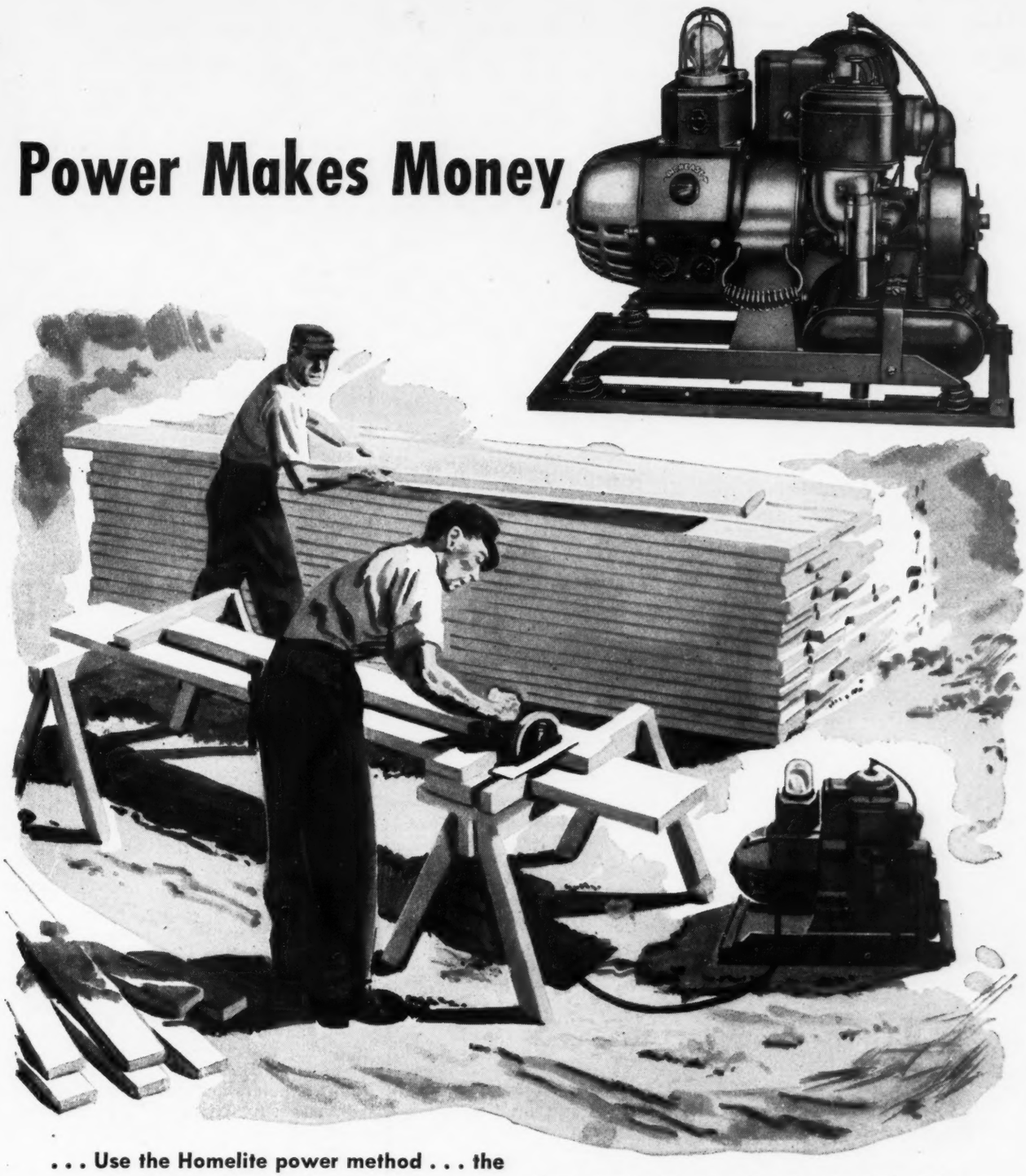
Johnson's Porto-Batcher is a complete, *portable* highway batching plant that provides fast, thorough on-the-spot mixing for many types of jobs — *wherever located.* It's compact, tows easily, erects quickly and meets all state highway requirements. *In addition to pavement work* PORTO-BATCHERS *are used as follows:*

- As an auxiliary to a large ready-mix plant on large buildings, or bridge jobs, where distance from the main plant is a factor.
- By ready-mix operators who do not have a suitable site for a larger plant or who lack an established market for ready-mixed concrete in smaller communities.
- By general contractors who have a source of aggregate in construction of bridges, buildings and other concrete structures.
- By gravel producers interested in furnishing ready-mixed concrete for odd jobs or renting the machine to general contractors (along with the sale of aggregate).
- By road contractors who have occasional small street jobs or highway patching contracts.

Ready Mix Plant
Bulk Cement Handling Equipment
Cement Storage Bins
Concrete Buckets
Batchers

THE C. S. JOHNSON COMPANY
Champaign, Illinois
A KOEHRING SUBSIDIARY

Power Makes Money



. . . Use the Homelite power method . . . the mass production method. All you do is line up your lumber, plug a power saw into a Homelite Portable Generator and the job is but a few seconds from being done.

With a Homelite Portable Gasoline-Engine-Driven Generator you never have any power problems. No waits for installations. No long cables. No gadgets. Just pick up your Homelite, put it where you want it, start it and you have 2000 watts . . . enough to operate several power tools or lights. Write us for complete information.

Homelite Corporation

Portable **PUMPS • GENERATORS • BLOWERS**

PORT CHESTER, NEW YORK

FOR FINISHING CONCRETE

Eliminate slow back-breaking knee work with . . .

Whiteman

CONCRETE EQUIPMENT

- Keep your finishers happy by ending laborious hand work . . . save money . . . and do a faster and better job with Whiteman equipment.
- The Whiteman Portable Rodding Machine (2 sizes) rods the slab to a perfect level while puddling and vibrating the entire depth.
- The Whiteman Dual-Purpose Floating and Finishing Machines (2 sizes) are the perfect mechanical troweling equipment . . . produce a dense, wear-resistant slab, free from riffles and depressions.

Write or wire for nearest distributor.

MODEL "RS" LIGHTWEIGHT RODDING MACHINE. For slab widths 3 to 10 ft. Also available in Model 44 for 10 to 20 ft. width.

MODEL "J" LIGHTWEIGHT FLOATING-FINISHING MACHINE. Trowel diameter 34" . . . goes through 36" doorways. Also available in Model "B", with 44" diameter trowel.

Whiteman **MANUFACTURING CO.**

3249 Casitas Avenue — Los Angeles 26, California

Ease of tire changing

ARMY (E) NAVY

A VALUABLE ROGERS LOW BED TRAILERS FEATURE

FORMERLY tire changing required jacking up the trailer and in some cases the removal of the whole axle unit. A big job in any event that was especially difficult if a tire went out while carrying a load.

With Rogers Trailer this job is comparatively easy, as it is possible to remove any tire without disturbing other casings.

ROGERS BROTHERS CORP. ALBION, PENNA.

ROGERS HEAVY DUTY Gooseneck Trailers

EXPERIENCE *builds 'em* — PERFORMANCE *sells 'em*

(Continued from page 164)

wide range of conditions. It permits working in the wet at a safe distance from the pier and need not be too objectionable in appearance when completed. With every force imaginable working adversely, it proved to be a most happy and successful expedient.

Direction

Design work was done under the direction of E. W. Wendell, deputy chief engineer; field supervision was by Ray Jordan and R. H. Cleveland, district bridge engineer, under P. J. Lamb, district engineer, New York State Department of Public Works. The photographs were made by John Minehan and by the writer.

★ ★ ★

Trunnion Yoke

(Continued from page 80)

clearance available where the tanks were to be set, these lifting lugs on the sides had to be burned off before the tanks were placed on the trunnion mechanism for turning to upright position. U-shaped iron bands, placed under the tanks, were used in lifting the tanks from the temporary blocks to the table of the trunnion unit. The top of the yoke was opened to admit the neck of the tank. As a safety measure, a $\frac{5}{8}$-in. cable attached to the trunnion yoke was wrapped once around the tank and was pulled fast with a ratchet chain hoist.

To turn the tank on the trunnion-mounted yoke, four cable eyes from a double sheave hung on the hook of an overhead crane were shackled to the lifting lugs at the rear of the tank. These cables and the double sheave formed an equalizing system for a four-point lift. The crane lifted the rear end of the tank gradually, at the same time traveling slowly in the direction that the tank was turning.

About 1 min. was sufficient to complete turning the tank from horizontal to vertical position. The safety cable then was removed, and a retaining plate connecting the two side beams at the top of the yoke was unbolted at one end and swung open to permit the crane to take the tank out of the trunnion apparatus and carry it to position for setting on its permanent concrete piers.

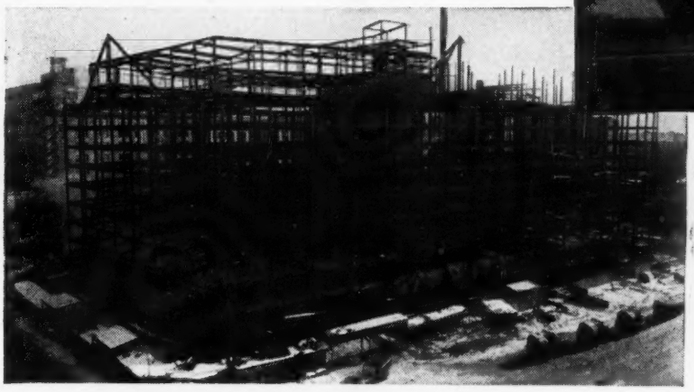
The trunnion apparatus served a second useful purpose when a tank had to be removed and replaced. In removing a tank, the turning operation was reversed.

OUT OF A WEALTH OF EXPERIENCE IN CEMENT MANUFACTURE

LEHIGH offers 4 CEMENTS covering the whole construction field

LEHIGH NORMAL CEMENT
for general concrete construction

Thousands of jobs built with Lehigh Normal Cement through the years have proven sound and durable. It will continue to have an important place in the construction field.

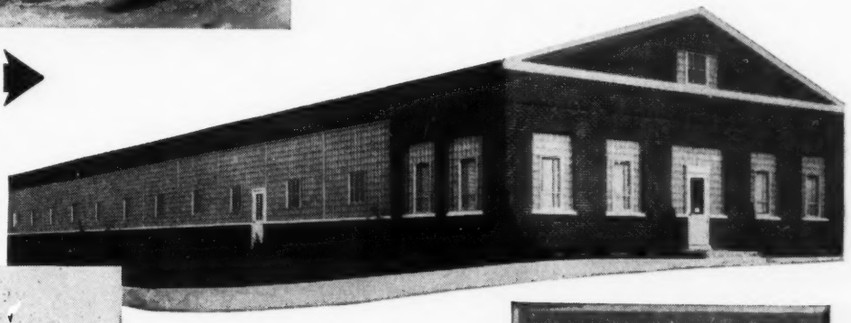


LEHIGH EARLY STRENGTH CEMENT
for jobs where speed is essential

Does a job quicker because it reaches service strength 3 to 5 times faster. Winter and summer, it cuts costs and reduces working time and overhead.

LEHIGH MORTAR CEMENT
for weatherproof walls

Makes a mortar with strong bonding qualities and minimum shrinkage. Easy to work. Successfully used with all types of masonry units . . . and for Stucco.



LEHIGH AIR-ENTRAINING CEMENT
for exposed surfaces

Minimizes scaling. Increases resistance to the action of freezing and thawing and to the effects of salts used for ice removal.

Lehigh CEMENTS

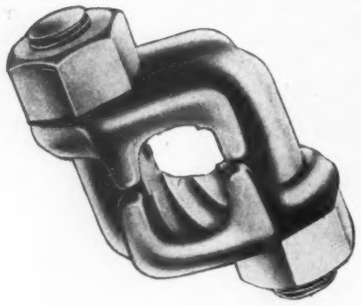
The Lehigh Service Department will be glad to consult with you regarding your own specific problems.

LEHIGH PORTLAND CEMENT COMPANY • ALLENTOWN, PA. • CHICAGO, ILL. • SPOKANE, WASH.

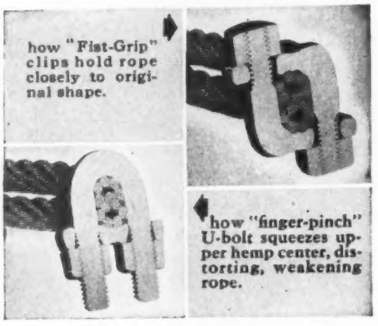
PROTECT

BETTER, PREFORMED ROPE WITH BETTER

"FIST-GRIP" CLIPS



Cross-section views (nuts tightened to same tension by torque-indicating wrench) show—


how "Fist-Grip" clips hold rope closely to original shape.
how "finger-pinch" U-bolt squeezes upper hemp center, distorting, weakening rope.

3 WAYS "FIST-GRIP" SAFETY CLIPS SAVE

1. They Save Skill by eliminating difficult, expensive splicing. Foolproof . . . can't be applied backward or upside down.

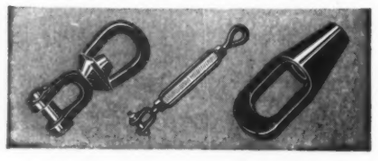
2. They Save Metal. Three "Fist-Grip" Safety Clips do work of 4 ordinary U-bolts. Improved bearing surfaces provide more friction. They save rope too because they don't crush or break it.

3. They save time. Easy and speedy to install. Fewer needed. No special wrenches.

Laughlin "Fist-Grip" Safety Clips are ideal not only for preformed wire rope but ordinary wire rope as well. The only clips with drop-forged bolts, their "Fist-Grip" is as strong as rope itself. Distributed through mill, mine and oil field supply houses. For a complete catalog on Laughlin's wire rope and chain hardware, write Dept. 1, The Thomas Laughlin Co., Portland 6, Maine.

LAUGHLIN

THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS



Modified Suction Dredge

(Continued from page 108)

apart. The new sections were lowered in place and welded. Deck and bottom shell connections were strengthened by riveted plates.

Other alterations included adding a 15-ft. extension to the A-frame ladder hoist support; increasing the digging angle of the 125-ft. ladder to 60 deg. with the horizontal to permit the dredge to work at a maximum depth; and moving the cutter drive gear to a new position on the hull end of the ladder. Because of its great size the ladder was launched the same as a vessel, upon completion of alterations. Temporary buoyancy tanks were mounted to the cutter end of the ladder to keep an even trim when afloat.

Depths of water in which the modified dredge operates preclude the use of spuds, so a three-way wire rope anchoring arrangement is used. The ropes are run from a point on the stern to three widely separated anchors, two forward to port and starboard and one directly astern. These ropes lead to windlass drums with controls in the pilot house.

In 6 weeks' operations with the 125-ft.

(Continued on page 170)

Make sure of home comfort and convenience

with hundreds of design and construction pointers

How you can plan your home to suit you, your needs, your comforts, your purse. Here is a book containing concrete suggestions on the selecting of land, planning the house, the proportion of individual rooms — sound counsel regarding construction, painting and decorating, landscaping, legal matters and financing, with many photographs and figures, floor and room plans, practical lists of pointers.

Just published!

PLANNING YOUR HOME FOR BETTER LIVING

By **CLARENCE W. DUNHAM,** Associate Professor of Civil Engineering, Yale University; Consulting Structural Engineer for the New York Engineering Office of the Anaconda Copper Mining Co.

and **MILTON D. THALBERG,** Advertising Manager, Cosa Corporation

278 pages, 7 x 10, 260 *photos and figures,* $4.00

This useful book considers every practical feature of the house you want to build, down to such specific points as electrical appliances, the good and bad features of heating units, the type of house to build. Details on **the nature of subsurface soil conditions—considerations in determining size of basement—choosing type of construction material**—and many others.

See it 10 Days on Trial!

McGRAW-HILL BOOK CO.
330 W. 42 St., N.Y.C. 18

Send me Dunham and Thalberg's Planning Your Home For Better Living for 10 days examination on approval. In 10 days I will send $4.00, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

Name.....
Address.....
City and State.....
Company.....
Position.....CM 12-45

Economical to Buy— Profitable to Use

Simplex Screw Jacks save man-hours on numerous construction operations because they lift with ease, speed and safety. Extremely moderate prices are made possible by volume production, resulting from extensive use. Yet these are quality jacks in every detail; such as the self-leveling drop forged cap which "floats" on a large chrome-molybdenum steel ball, reducing friction 88%. Safety peephole in unbreakable malleable iron base prevents over-extension of screw. It pays to have plenty of Simplex Screw Jacks.

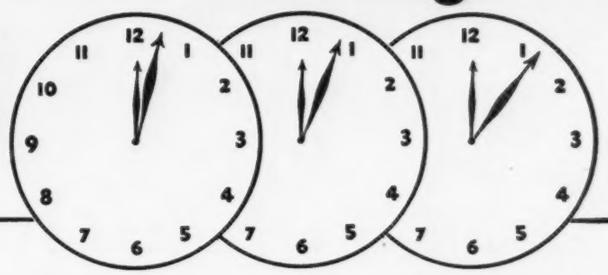
Simplex Screw Jacks are made in 19 sizes with 4-Way Head; 9 sizes with Ratchet Head; 8¾" to 22½" high; 4" to 14¼" lift; 5 to 24-tons capacity.

ARMY E NAVY

Templeton, Kenly & Co.
Chicago (44) Ill.

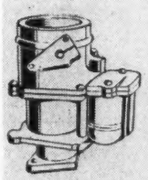
Simplex
LEVER SCREW HYDRAULIC
Jacks

How to Cut Metal Cleaning Time to MINUTES



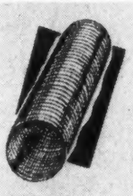
NEW, FAST-ACTION DETERGENT CLEANS FERROUS AND NON-FERROUS METALS...Easy to Handle

TYPICAL USES FOR Solvent "26"



CARBURETORS—Solvent "26" removes gum, gasolene sediment and other accumulations of dirt.

SPARK PLUGS—Solvent "26" safely cleans porcelain; helps loosen carbon deposits.



METAL PLATES AND SCREENS—Solvent "26" restores clear, clean finish to any metal surface.

DIES AND STAMPING—Solvent "26" removes drawing compounds from die-formed or stamped metal.

LABORATORY EQUIPMENT—Solvent "26" frees glass and metal tubing and their supports of gums, varnishes and other incrustations or deposits.

PISTONS—Removes lacquers, gums, resins, etc. from gas, gasolene and diesel engine pistons and rings. Also effective for cleaning all parts of dismantled motors, engines and machinery.

REMOVES:

Oil • Grease • Gums • Varnishes • Lacquers • Paints
Carbonaceous Deposits • Asphaltic Products

FROM:

Steel • Cast Iron • Aluminum • Porcelain • China
Chrome and Nickel Plate • Stone • Precious Metals
Brass • Washable Fabrics

Used throughout the war in critical industry as a superior cleaning agent, newly-developed SOLVENT "26" is now available for all industrial needs.

Offering many advantages in time, labor and cost over other present cleaning methods . . . Solvent "26" is so effective a detergent it can be used at *ordinary* room temperatures.

The fast action of Solvent "26" reduces cleaning time from hours to minutes on dismantled engine parts and all kinds of machinery. Simply dip, rub, brush or spray it on. Then flush clean with hot water.

Mail the coupon today for literature and information leading to a demonstration of this unique product in your own plant.

CITIES SERVICE OIL COMPANY
ARKANSAS FUEL OIL COMPANY

CITIES SERVICE OILS — ONCE-ALWAYS

Cities Service Oil Company
Room 528
70 Pine Street
New York 5, N. Y.

Gentlemen: I am interested in a demonstration of Solvent "26"—at no cost or obligation.

Name.....
Title.....
Company.....
Address.....
City.....State.....

Fewer hands—faster placing—stiffer mix—uniform strength and density—better bond with reinforcement—no voids or honey-combs—these are just a few of the advantages you get with a Mall Concrete Vibrator. When it is not being used to vibrate concrete, the Mall Vibrator can be adapted to Surfacing, Form Sanding, Wire Brushing, Grinding and Drilling. The attachments for these operations are easily and quickly interchanged with the vibrating element.

1½ H.P. Gasoline Powered model available, also 3 H.P. round base or wheel barrow mounting, 1½ H.P. Universal Electric and 7500 r.p.m. Pneumatic Units.

Ask your distributor for Mall Concrete Vibrators, MallSaws, Mall Chain Saws and Mall Drills or write for literature and prices.

MALL TOOL COMPANY, 7757 South Chicago Ave., Chicago 19, Ill.

ASSOCIATED EQUIPMENT DISTRIBUTORS AED MEMBER

Mall REG. U.S. PAT. OFF. PORTABLE POWER TOOLS

THE OWEN BUCKET CO.
6020 Breakwater Avenue Cleveland, Ohio
Branches: New York, Chicago, Philadelphia, Berkeley, Cal.

(Continued from page 168)

ladder the dredge averaged 11,000 cu. yd. of solids per day. To reach a final depth of 100 ft. it was found necessary to dredge at three levels. The first and second cuts are made to levels of 65 ft. and 85 ft.

★ ★ ★

Radiant Heating

(Continued from page 77)

room air temperature, can be used to calculate conductance and infiltration losses much the same as the procedure used in calculating losses for a conventional heating system.

In choosing a pipe design for a radiant heating installation, the trend seems to be toward sinuous coils for small rooms and grids for large areas. Generally, a coil system is slightly less expensive to fabricate and easier to design. As the coil system lengthens, however, frictional resistance approaches the limiting head to which a circulator can work. The grid system, though requiring more welding, has a lighter hydraulic load and provides excellent thermal distribution.

Boiler piping details in a radiant heating system are the same as for conventional forced hot water systems. Balancing cocks for each element of the system usually are installed in the floor with a removable traffic plate or, in the case of wood floors, valves may be accessible through hinged panels below or above the pipes or in other out of-the-way places. The purpose of these valves is to control water flow, thereby controlling heat output. In this way, the heating requirements for individual rooms or areas can be balanced. Once the valves are adjusted, they need not be touched again until heat requirements change.

Supplementary wall or ceiling coils are used when the floor temperature cannot be held to 85 deg. or less while carrying the required heat load in the floor coils. Generally, floor surface temperatures remain under this figure if the required output is not in excess of 75 to 80 B.t.u. per hr. per sq. ft. of floor. However, outputs as high as 150 B.t.u. per hr. per sq. ft of floor have been observed with a floor temperature of 70 deg. Over-heated floors are not possible in properly designed systems.

Increased Use in Large Buildings

In addition to its use in many hundreds of residential installations, radiant heating is being adopted for factories, offices,

(Continued on page 172)

You Can MAKE MORE MONEY ON JOBS LIKE THIS with MICHIGAN mobile SHOVELS–CRANES!

Here's Why: TRUCK MOBILITY cuts travel-time between jobs. No trailer or tow-truck required. QUICK CONVERTIBILITY means change-overs made in two hours or less—and one MICHIGAN handles five types of work—shovel, crane, clamshell, dragline, trench hoe. FINGERTIP AIR CONTROLS step up hourly output, get the job done faster, minimize operator fatigue! . . . But get *all* the facts about these profit-earning MICHIGANS —3/8 and 1/2 yard capacities, 6 to 12 ton cranes. Write for your copy of MICHIGAN Bulletin CM-125.

MODEL
T-6-K
3/8 YD. SHOVEL
6 TON CRANE

ARMY E NAVY

MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR, MICHIGAN

FREE!

The famous 64-page, fact-packed book that has stimulated thousands of men!

"Forging Ahead in Business" is a practical, thoughtfully-written book with "punch" and common sense on every page. It carries a message of vital importance to every man who wants to make more money, get a better job and improve his station in life.

Partial Contents:

- Law of Success
- Forging a Career
- Organized Knowledge
- Highway of Achievement
- Making Decisions
- Failure and Success

Noted Contributors

Among the prominent men who have contributed to the Institute's training plan, which is described in "Forging Ahead in Business," are: Thomas J. Watson, President, International Business Machines Corp.; Clifton Slusser, Vice President, Goodyear Tire & Rubber Co.; Frederick W. Pickard, Vice President and Director, E. I. du Pont de Nemours & Co.

Simply return the coupon below, and your FREE copy of "Forging Ahead in Business" will be *mailed* to you.

MAIL COUPON TODAY

ALEXANDER HAMILTON INSTITUTE
Dept. 348, 71 W. 23rd St., New York 10, N. Y.
In Canada:
54 Wellington Street, West, Toronto 1, Ont.

Please mail me, without cost, a copy of the 64-page book—"FORGING AHEAD IN BUSINESS."

Name.....
Firm Name.....
Business Address.....
Position.....
Home Address.....

(Continued from page 170)

schools, hospitals, churches, theaters and other large structures. Reasons for the increasing popularity of radiant heating are twofold, lower costs and greater comfort. The lower costs are the result of lower temperature requirements for boilers, fewer cleaning and renovating bills and maximum utilization of space. Increased comfort is the result of the feeling of warmth and freshness which radiant heat produces in an air temperature much lower than that required with conventional heating systems.

If postwar construction tends toward basementless designs, radiant heating should be most popular, as it is the only system devised to date that assures warm, dry floors. Heat losses into the ground are generally estimated at approximately 25 to 30 percent of the upward flow—not much greater than the ground losses which would be encountered from the same space using a conventional heating system. If good insulating material is used between the pipes and the ground, the downward losses may be assumed to be about 10 to 20 percent. Losses by conductance through concrete slabs on grade are greatest at the edge of the slab and through footings.

Construction engineers and contractors are familiar with the effects of heat on concrete. Because of the relatively low temperature of the water in properly installed radiant heating coils or grids, the possibilities of cracking are negligible. Also, the low-temperature heat from the coils may hasten high early strength of the concrete, if properly cured.

System Aids Winter Work

During cold-weather, radiant systems can be used to heat interior construction jobs, as these systems usually are installed immediately after the foundation. Thus, comfortable working conditions, conducive to more and better work, are provided for carpenters, painters, electricians and other craftsmen during cold weather. A heated interior also eliminates the need for salamanders which, if improperly handled, are definite fire hazards on a construction job.

The operation of radiant systems with relatively low temperatures and velocities would seem to preclude the need for air vents in the piping, but most designers prefer to vent the mains at high spots or wherever the plane of the system changes. Vents, tapped into the pipe, may be located under traffic plates or at other convenient places.

Control Devices

Somewhere between the temperature of the warmest and coolest surfaces of a room there is one temperature which would equal that of all surfaces in a uni-

(Continued on page 174)

Look for the Arm-and-Hammer

ARMSTRONG BROS.
BETTER PIPE TOOLS

Threads of Lathe-cut Smoothness

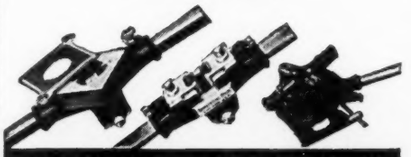
Machined from special oil-tempered Chrome-Vanadium Tool Steel, with hob-cut teeth "backed-off" from their ground cutting points; with accurately figured cutting angles and chaser rakes and ample chip clearance, these finer dies produce threads of lathe cut smoothness. They cut freely, faster, without drag and spin off the pipe without tearing or jamming.

Hardened, drawn, tempered and tested, they hold their keenness and free-cutting qualities.

They fit all standard made Stocks or Threaders—"Adjustable," "Receding" or "Solid"—come in all pipe sizes from 1/4" to 2".

ARMSTRONG BROS. Stock and Receding Threaders are improved in design, accurately balanced and machined inside and out.

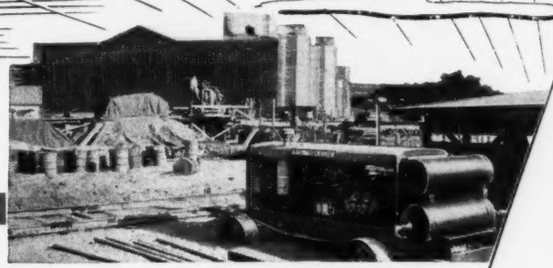
Write for Catalog



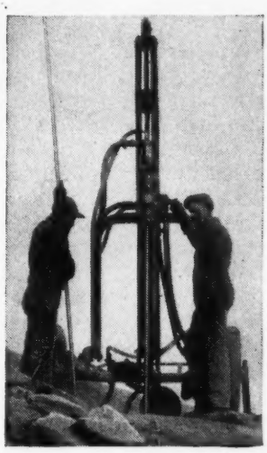
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
334 N. FRANCISCO AVE. • CHICAGO, U.S.A.

Eastern Sales Office: 199 Lafayette St., N. Y. 12
Pacific Coast Whse. & Sales Office
1275 Mission St., San Francisco 3, Calif.

A NEW HORIZON FOR POSTWAR JOBS



To keep pace during the period of great postwar activity—to get the jobs done fast and well at the lowest cost—you will want Gardner-Denver equipment. Proved on the most grueling jobs, its rugged construction and superior design permit continuous operation—assure minimum operating and maintenance costs.



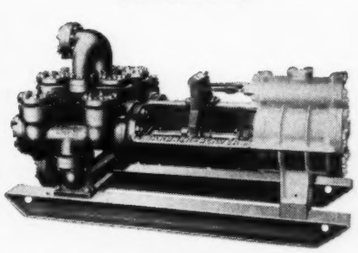
Gardner-Denver Wagon Drills—highly maneuverable on hillside or rough ground, spot quickly, drill fast.

Gardner-Denver Sinkers—easily handled because of their perfect balance and smooth operation—speed up drilling.

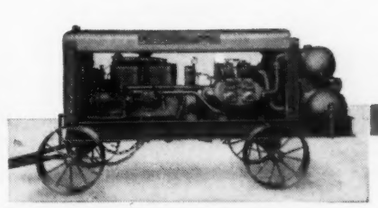
Gardner-Denver Spaders—for faster footage in any digging job.

Gardner-DenverPavement Breakers deliver fast cutting blows for demolition work.

Gardner-Denver Backfill Tamper—fast, powerful, easy to walk over the fill.



Gardner-Denver Grout Pumps—built tough—offer resistance to the wear caused by abrasive cement.



Gardner-Denver Water Cooled Compressors—completely water jacketed to provide continuous cool operation and discharge temperature.

For complete information on Gardner-Denver equipment, write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER *Since 1859*

MASTER COST-SAVING EQUIPMENT—FOR IMMEDIATE DELIVERY

Gas or Electric Concrete Vibrators (Catalog No. 689)

Hand Tools for operating from all Master Vibrators and BIG-3 (Catalog No. 633)

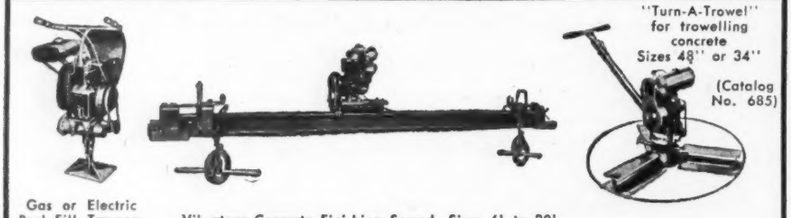
BIG-3 for Generation, Tool Operation and Concrete Vibration (Catalog No. 687)

Portable Gas-Electric Generator Plants. Sizes 500 to 17000 Watts (Catalog No. 594)

General Purpose Floodlights

"Power-Blow" Electric Hammer and Spade (Catalog No. 688)

Electric Pavement Breaker (Cat. No. 718)



Gas or Electric Back-Fill Tampers (Catalog No. 699)

Vibratory Concrete Finishing Screed. Sizes 6' to 30' (Catalog No. 596)

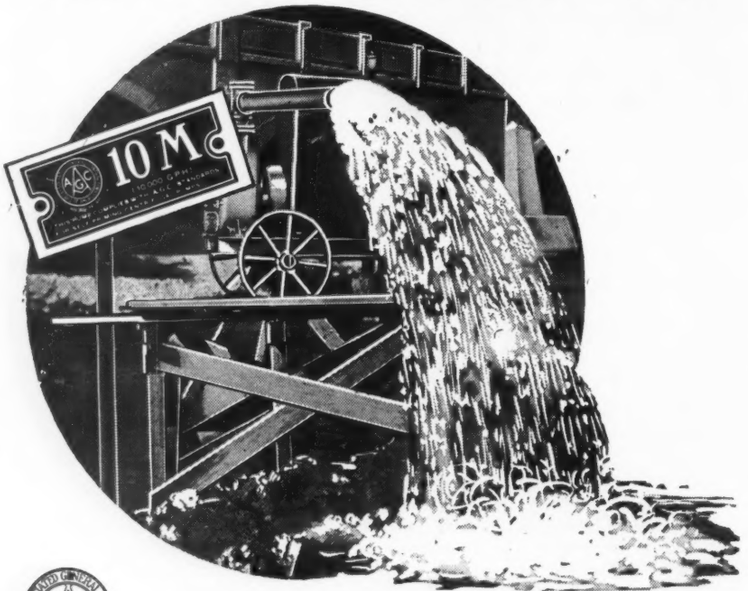
"Turn-A-Trowel" for trowelling concrete Sizes 48" or 34" (Catalog No. 685)

Send for illustrated catalog on any item to

MASTER VIBRATOR COMPANY

DAYTON 1, OHIO

SEAL OF SATISFACTION



You can be sure of satisfactory pump performance by choosing a pump carrying the AGC rating plate. It is your assurance that the pump will deliver full rated capacity.

CONTRACTORS PUMP BUREAU

BARNES MANUFACTURING CO. Mansfield, Ohio
CHAIN BELT COMPANY Milwaukee, Wis.
JAEGER MACHINE CO. Columbus, Ohio
C. H. & E. MANUFACTURING CO. Milwaukee, Wis.
CONSTRUCTION MACHINERY CO. Waterloo, Iowa
MARLOW PUMPS Ridgewood, N. J.
Affiliated with
THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC.
STERLING MACHINERY CORP. Kansas City, Mo.
CARVER PUMP CO. Muscatine, Iowa
THE GORMAN-RUPP CO. Mansfield, Ohio
NOVO ENGINE CO. Lansing, Mich.

(Continued from page 172)

formly heated room where the same radiant heat loss from the body would occur. This equivalent temperature is called the mean radiant temperature, or MRT.

Because of the close relationship between air temperature and the MRT it is practically impossible to depress air temperatures below the MRT without extensive refrigeration, and it is unlikely that air temperature would ever remain appreciably above the MRT for any length of time. It is possible therefore to install any of the conventional temperature control devices in a radiant heating system. Hundreds of systems use ordinary room-air thermostats. In larger structures, outdoor temperature devices have been used to actuate the heating system in advance of the actual heating demands inside, and excellent results have been reported from the use of such controls.

Question of Corrosion

Selection of a piping material like wrought iron, highly resistant to corrosion, is extremely important. Even with a closed hot water heating system, in which interior corrosion is not a matter of great concern, a corrosion resistant material is desirable to avoid restriction of flow by tuberculation. When steam is used, resistance to severe corrosive conditions set up by condensation becomes even more important. Corrosion resistance provides protection also against damage by exterior condensation, seepage or leaks through the building structure.

Safeguards Against Freezing

Generally, shutdowns resulting from failure of electric power or fuel supply are of short duration, and the relatively large thermal capacity of the structure —especially where the pipes are in a concrete slab—can be counted on to hold temperatures above freezing until service is restored. When means for drainage are desirable to prevent freezing, the most positive is to pitch all pipes, about ¼ in. in every 10 ft., toward a common low point where a tap or drain line can be installed. For heating pipes which have been laid level, or nearly so, compressed air may be used to blow out the lines, or a drainage device may be opened, while the circulator continues to run, thus evacuating a large percentage of the water. The latter practice does not give much protection against freezing.

Leaving some heat on during periods of non-use in winter is commonly relied upon, particularly in residences, to prevent freezing. Most owners prefer it to draining a system. As a final expedient, not often necessary, various permanent-type anti-freeze liquids can be injected into the water with good results.

Advertisers in this issue

Adams Mfg. Co., J. D. 117
Alemite Div., Stewart-Warner Co. 123
Alexander Hamilton Institute 172
Allied Steel Products, Inc. 154
Allis-Chalmers Mfg. Co. 27
American Bosch Corp. 57
American Chain & Cable Co., Inc. (American Cable Division) ..... 3rd Cover
American Hoist & Derrick Co. 25
American Manganese Steel Div., American Brake Shoe Co. 148
Armstrong Bros. Tool Co. 172
Armstrong Rubber Co. 64
Athey Products Corp. 39
Atlas Powder Co. 16
Austin-Western Company 55
Baker Mfg. Co., The 28
Barber-Greene Co. 8, 163
Barnes Manufacturing Co. 150
Bay City Shovels, Inc. 56
Bethlehem Steel Co. 10
Briggs & Stratton Corp. 136
Broderick & Bascom Rope Co. 125
Buckeye Traction Ditcher Co. 161
Bucyrus-Erie Co. 22
Buda Company 126
Carlyle Rubber Co., Inc. 152
Carter Co., Ralph B. 175
Caterpillar Tractor Co. 38
C. H. & E. Manufacturing Co. 175
Chain Belt Company 13
C.I.T. Corporation 144
Cities Service Oil Co. 169
Clark Electric Co., Jas. Jr. 126
Cleveland Rock Drill Div., Cleveland Pneumatic Tool Co., The 60
Clyde Iron Works, Inc. 32
Coffing Hoist Co. 156
Complete Machinery & Equip. Co., Inc. 175
Construction Machinery Co. 160
Contractors Hardware Corp. 175
Contractors Pump Bureau 174
Cummins Engine Co., Inc. 139
Davey Compressor Co. 130
Electric Tamper & Equipment Co. 141
Embury Mfg. Co. 164
Etnyre & Co., E. D. 156
Euclid Road Machinery Co., The 7
Fawick Airflex Co., Inc. 54
Firestone Tire & Rubber Co., The 43
Foote Co., Inc., The 137
Ford Motor Co. 20
Fruehauf Trailer Co. 46
Gar Wood Industries, Inc. 26, 124
Gardner-Denver Co. 173
General Electric Co. 53
General Excavator Co., The 29
General Motors 48
(Detroit Diesel Engine Div.)
General Tire & Rubber Co., The 23
Goodrich Co., The B. F. 9
Goodyear Tire & Rubber Co. 70
Gorman-Rupp Co., The 40
Griffin Wellpoint Corp. 134
Gulf Oil Corp. 155
Haiss Mfg. Co., Inc., Geo. 128
Harnischfeger Corp. 147
Heil Company, The 145
Hercules Steel Products Co. 138
Hetherington & Berner, Inc. 162
Homelite Corp. 165
Hooper & Sons Co., Wm. E. 17
Huber Mfg. Co., The 135
Independent Pneumatic Tool Co. 21
Ingersoll-Rand 37
Inland Steel Co. ..... 2nd Cover
Insley Mfg. Corp. 134
Iowa Manufacturing Co. 62
International Harvester Co. 127
Isaacson Iron Works 131
Jaeger Machine Co., The 49
Johns-Manville Corp. 42, 159
Johnson Company, The C. S. 164
Jones & Laughlin Steel Corp. 113
Koehring Company, The 34
LaPlant-Choate Mfg. Co., Inc. 50, 51
Laughlin Co., The Thomas 168
Lehigh Portland Cement Co. 167
Le Roi Company 122
Leschen & Sons Rope Co., A. 61
Le Tourneau, Inc., R. G. 58, 59
Lima Locomotive Works, Inc. 69
Link-Belt Speeder Corp. 153
Lone Star Cement Corp. 5
Lufkin Rule Co., The 158
Macwhyte Co. 151
Mall Tool Co. 170
Master Vibrator Co. 174
McGraw-Hill Book Co., Inc. 168, 176
McKiernan-Terry Corp. 176
Mercer-Robinson Co., Inc. 128
Michigan Power Shovel Co. 171
Mines Equipment Co. 160
Moretrench Corp. 68

(Continued on page 176)

SEARCHLIGHT SECTION

UNDERWATER METAL CUTTING
General Construction—Pipe Line—Salvaging or repair. Improved methods with the latest Diving Equipment.
Service any place. Job or Contract.
B & S ENGINEERING CO.
MARINE DIVING SERVICE
50 Weidner Avenue Oceanside, L. I., N. Y.
Tel. Rockville Centre 4265

WHERE TO BUY

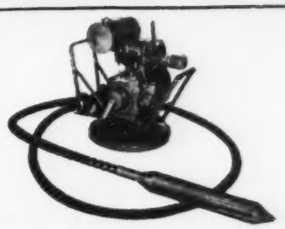
COMPLETE
WELL POINT SYSTEMS
WILL DRY UP ANY EXCAVATION
Faster—More Economically
Write For Job Estimate and 32 page Catalog
COMPLETE
MACHINERY & EQUIPMENT CO., Inc.
36-36 11th St., Long Island City, N. Y.
Tel. IRonsides 6-8600
Branch: Third Avenue & Adams St., Gary, Indiana
Telephone: Gary 23083

HUMDINGER
SELF PRIMING
CENTRIFUGALS and DIAPHRAGMS

TO 8" SIZES
PORTABLE PUMPS
FOR HEAVY DUTY
RALPH B. CARTER CO.
HACKENSACK, N. J.
ASK YOUR DISTRIBUTOR

STERLING PUMPS
STERLING QUALITY

CHOICE OF LEADING CONTRACTORS EVERYWHERE
SIMPLE
DEPENDABLE
RUGGED
•
WRITE NOW
STERLING MACHINERY CORPORATION
405 Southwest Blvd., Kansas City, Mo.


Concrete VIBRATORS and Grinders
Write for Circular on types, sizes and prices
White Mfg. Co.
ELKHART INDIANA

HEAVY HARDWARE

CONSTRUCTION
SUPPLIES • TOOLS • EQUIPMENT
Contractors HARDWARE CORP.
10-80 JACKSON AVE., LONG ISLAND CITY 1, N. Y.

C. H. & E. CONSTRUCTION EQUIPMENT
Triplex Road Pump
For road paving work a good strong pump is needed to supply water for the paving mixer and other equipment on the job. Capacities from 80 to 150 gals.
Write for Bulletin

C. H. & E. Manufacturing Co.
Milwaukee Wis.

NEW ADVERTISEMENTS
received by December 31 appear in the January issue, subject to space limitations
Address copy to the Departmental Staff
CONSTRUCTION METHODS
330 West 42nd St., New York City 18, N.Y.

SEARCHLIGHT SECTION

BE A SUCCESSFUL BIDDER

The successful bidder is the man who bids the right price. A correct estimate is the foundation of any builder's success. A job taken too cheap results in a loss; a job bid too high is lost to a competitor. Whether you are a beginner or experienced in estimating, you can't afford to pass up this offer to examine the Tamblyn System of Estimating absolutely free. This system is based on forty years of actual construction experience and by its use you can estimate costs according to your local rates and conditions. Thousands have used it successfully during the twenty-five years it has been on the market. This year the course has been completely revised to help you get your share of the postwar business. Study the course for ten days absolutely free. If you decide you don't want to keep it, just return it. Otherwise send us $5.00 and pay the balance of $25.00 at $5.00 per month, making a total of $30.00 for the complete course. Send us your name and address today, and we will send you plans, specifications, estimate sheets, a copy of the Building Labor Calculator, and complete instructions. What we say about this course is not important, but what you find it to be after you examine it is the only thing that matters. You be the judge, your decision is final.

TAMBLYN SYSTEM, Johnson Building CM, Denver 2, Colorado

FOR SALE
2½ yd. dragscraper outfit, completely rebuilt, new condition. Sacrifice. Can operate over 600 ft. radius, excavate and move 75 yds. average of 250 ft. per hour with loading.
STEVENS FOUNDRY
70 PINE STREET NEW YORK 5, N. Y.

FOR SALE
6615 ft.—7.4" ODx ½" Wall x 27'-29' lg., SAE1035, New H. R. Seamless Steel Tubing
S. MANN COMPANY
1630 Vine Street, Philadelphia 3, Pa.

Advertisers Index

(Continued from page 175)

National Lead Co. 120
Northwest Engineering Co. 111
Novo Engine Co. 146
Oakite Products, Inc. 142
Oliver Corp., The 2, 3
Osgood Co., The 29
Owen Bucket Co., The 170
Parsons Co., The 132
Pettibone Mulliken Corp. 63
Pioneer Engineering Works 35
Rapid Pavement Breaker Co. 176
Robinson Air-Activated Conveyor System Div., Morse-Boulger Destructor Co. 130
Rodgers Hydraulic, Inc. 47
Rogers Bros. Corp. 166
Rogers Iron Works Co. 65
Schramm, Inc. 15
Science Illustrated 118, 119
Seaman Motors 67
Searchlight Section 175
Shell Oil Company 129
Shunk Manufacturing Co. 138
Siebring Mfg. Co. 152
Sinclair Refining Co. 36
Sisalkraft Co., The 154
Skilsaw, Inc. 149
Smith Engineering Works 44
Snap-on Tools Corp. 33
Socony-Vacuum Oil Co., Inc. 30, 31
Sonoco Products Co. 160
Southwest Welding & Mfg. Co. 14
Standard Oil Co. (Indiana) 66
Sterling Machinery Corp. 175
Sterling Wheelbarrow Co. 158
Syntron Company 116
Templeton, Kenly & Co. 168
Texas Company, The 18, 19
Thermoid Company 121
Thew Shovel Co., The 52
Timken-Detroit Axle Co., The 157
Timken Roller Bearing Co., The ..... 4th Cover
Union Iron Works, Inc. 142
Union Metal Mfg. Co. 24
Union Steel Products Co. 162
Unit Crane & Shovel Corp. 6
United States Steel Corp., Subsidiaries 12
Universal Atlas Cement Co. 12
Viber Company 148
Vickers, Inc. 115
Vulcan Iron Works 164
Warner Brothers Co., The (Spiratube Division) 45
Wellman Engineering Co., The 150
White Mfg. Co. 175
Whiteman Mfg. Co. 166
Wickwire Spencer Steel Co. 133
Williams & Co., J. H. 41
Wood Shovel & Tool Co., The 140
Worthington Pump & Machinery Co. 142, 143

McKiernan-Terry

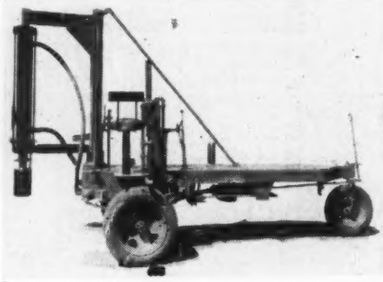
PILE HAMMERS

For many years McKiernan-Terry Pile Hammers have been the choice of engineers and contractors on major construction projects throughout the world. During the War, they were used widely by Army and Navy Departments for construction and reconstruction work on ports, bridges, dams, etc. in every theatre of operations. To meet these and other heavy demands of the Army, Navy and Maritime Commission, our Dover and Harrison, N. J. plants have been greatly expanded. These enlarged facilities are now available for the many peace-time projects requiring Pile Driving Equipment, Hoisting Equipment, Marine Equipment, Heavy Construction Equipment and/or Specially Engineered Equipment or Machinery.

Write for Bulletins

McKIERNAN-TERRY CORPORATION

14 Park Row New York 7, N. Y.



Junior

RAPID PAVEMENT CONCRETE BREAKER

Fastest Pneumatic Method
Cuts Cost and Time
Works Inside or Out
Vertical or Horizontal
Good for all Small Jobs

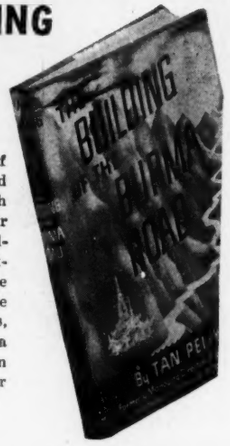
Ask about our

HEAVY-DUTY TYPE

RAPID PAVEMENT BREAKER COMPANY

1517 Santa Fe Ave. Los Angeles 21, Calif.

Thrill to this first-hand story of a present-day ENGINEERING miracle



This is the story of what it meant to build the Burma Road with never enough men or money, without bulldozers, rod-drills, excavators or dynamite—a 717-mile struggle across mountains, rivers and jungles; a battle for survival in which 10,000 lost their lives.

Just Published

THE BUILDING of the BURMA ROAD

By TAN PEI-YING

Formerly Managing Director of the Yunnan-Burma Highway Engineering Administration

200 pages, 5½ x 8, 25 illustrations, $2.75

In this book, Tan Pei-ying, who was placed in charge of the road's construction in 1938, admirably blends the factual and technical details with local color and historical perspective. Here the author tells how 717 miles of road was laid—with never enough men or money, with almost no modern equipment, overcoming all the obstacles Nature could provide: heat and cold, disease, almost impenetrable rock, rain and liquid mud.

THE NEW YORK SUN says:

"Along with the account of the operations, we are given much curious and interesting information about the largely unknown country through which the roadway was cut and about the people, together with some fascinating bits of history."

READ ABOUT—the "suicide swimmers" who made bridge building possible by swimming the swift perilous rivers with cords held in their teeth to draw cables across; the powder man of Paoshan who could set as many as 30 charges of gunpowder in a few seconds, scrambling over slippery rocks where a single misstep meant death; the construction of a homemade pontoon ferry across the Salween River and how it was propelled by two Diesel tractors, one on each bank.

"A great human drama, a modern engineering miracle, is recorded in intensely interesting narrative about a road that will be famous in history."
—THE PHILADELPHIA EVENING BULLETIN

Now you can read the story behind the headlines, see just how amazing this achievement was, read about the people who worked and lived and died in the construction of the famous highway. Just send the coupon, and see your copy of this book 10 days' on approval.

McGraw-Hill Book Co., 330 W. 42 St., New York 18

Send me Tan's BUILDING OF THE BURMA ROAD, for 10 days' examination on approval. In 10 days I will send $2.75, plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by cash remittance.)

Name.....

Address.....

City and State.....

Company.....

Position..... CM 12-45

In Canada: Mail to Embassy Book Co., 12 Richmond St. E., Toronto 1

TRU·LAY Preformed

(IMPROVED PLOW STEEL)

All-Green Rope stuffed with still longer life!

• Every single strand of TRU·LAY Preformed is literally *stuffed* with American Cable's green lubricant—a high viscosity, leathery substance which adheres to the inner wires and *won't work out.* This means that the many inner wires, which you can't see, are provided with a slip-easy film of oil plus being thoroughly protected against corrosion. And when the wires move past each other without undue friction, and are protected against corrosion, the entire rope structure is benefited. That's why TRU·LAY Preformed *All-Green* rope lasts *still* longer—gives even *better* service. Specify American Cable TRU·LAY Preformed *All-Green* rope for your next line.

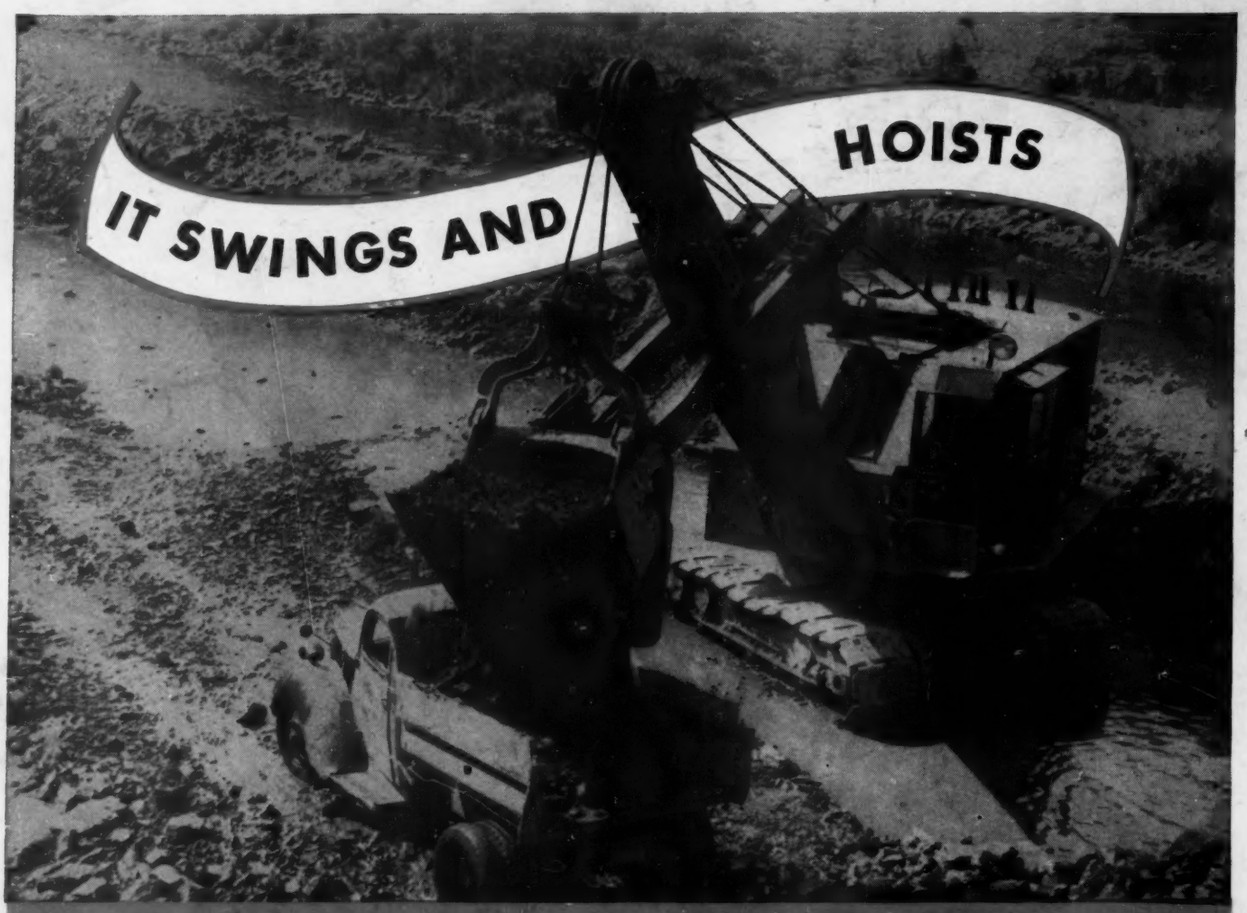
ACCO

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, He

AM
AME

TRADE MARK

In Business for Your Safety



ON TIMKEN BEARINGS

This 2 cubic yard Marion Shovel, like other models of the Marion line, uses Timken Tapered Roller Bearings to improve performance; increase endurance; and reduce maintenance. The horizontal shaft, swing and clutch shaft, vertical shaft and hoist drum shaft are all mounted on Timken Bearings. This protects these vital heavy-duty parts against friction; wear; radial, thrust and combined loads; and misalignment. It is an important factor of smooth, dependable, low cost operation.

The shovel shown in the photograph was working on a flood control project in Pennsylvania when the picture was made, the particular job being the widening of a creek bed.

When buying a new shovel, excavator, dragline or construction equipment of any kind be sure it is equipped with Timken Bearings. To make sure of getting Timken Bearing performance, see that the trade-mark "TIMKEN" is stamped on every bearing that goes in your machines.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO